

electrical contracting

*Industrial
Electrification*
SECTION

PAGES 57-74

MAY • 1941



American Airline Photo

Light launches the modern airship in its flight and guides it safely down again. It has become as vital to the control of air traffic as the roads. See page 19 for its latest story.

What Do YOU Look for in a Floodlight?



MAXIMUM EFFICIENCY?

You have it when you use G-E spun-aluminum floodlights—Type L-49, L-43, and L-68—because the reflector is accurately contoured. Deformation is prevented by a strengthening rolled bead around the reflector. And, the polished (specular) and etched (diffused) *Alzak-finished-aluminum surface has better than 80 per cent reflectivity.

*Manufactured under Aluminum Company of America patents

ATTRACTIVE APPEARANCE?

Smooth flowing lines, the absence of gingerbread, liberal use of die-cast and die-formed parts—all share in making G-E spun-aluminum floodlights clean-cut and attractive. The natural-aluminum finish of socket housing and reflector harmonizes with the galvanized mounting arrangements.

EASY INSTALLATION?

All cross arms can be drilled alike. A continuous 180-degree slot in the base of the cross-arm bracket makes it unnecessary to know the direction of the floodlight beam in advance. Holding and positioning bolts are on different levels—a small detail but it prevents skinned knuckles. Are you mounting one floodlight on a pole top? You have a choice of two different mounting arrangements. Or do plans call for attaching several floodlights to a horizontal pipe? An inexpensive pipe clamp is available. Are you using wooden or angle-iron cross arms? You have a choice of either oval base or trunnion bracket. And remember, all mounting arrangements are cast iron with hot-dip galvanized finish.

EASY SERVICING?

Only in the G-E Type L-68 floodlight can you—and your customer—get these three features that make

servicing easier: a 240-degree tip-over to raise the floodlight to servicing position; a repositioning stop for returning the unit accurately to the lighting position; and a slide-type door glass for easy removal and less accidental breakage. These extra-value features have proved their worth on many installations—yet they cost you nothing extra.

PROVISION FOR WINTER STORAGE?

Release four screws—a slight turn to the left—the reflector is off and ready for winter storage. And there is no gasket or asbestos cement to make additional work when the reflector is replaced in the spring.

MINIMUM MAINTENANCE EXPENSE?

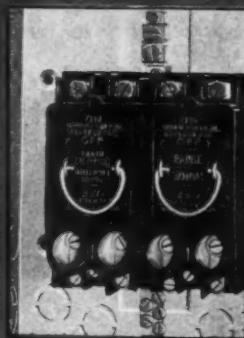
More than 25 years of floodlight manufacture has resulted in a simple, dependable, spun-aluminum design to meet your customers' constantly increasing demand for low maintenance costs. For example, the one-piece, die-cast-aluminum socket housing will not allow water to enter and drop on the lamp, or require periodic painting to prevent rust. The two-conductor cable enters through a conical rubber bushing that squeezes the cable to eliminate strain on binding-post screws and wearing of insulation. Even the socket—with the cast-in-place heat baffle and two-screw-type, sheet-brass binding posts—is built to withstand hard service.

For tough jobs, as well as average, recommend G-E spun-aluminum floodlights—you'll find them easiest to sell. You'll find installation easy—and your profits larger. For equipment or recommendations call the nearest G-E office. General Electric, Schenectady, N.Y.

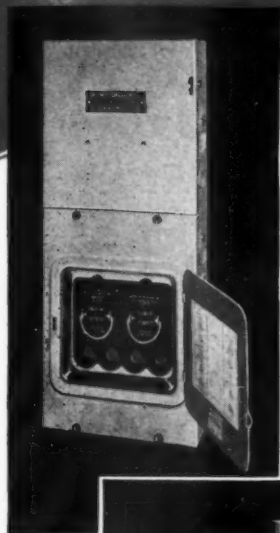
GENERAL ELECTRIC

451-42-3200

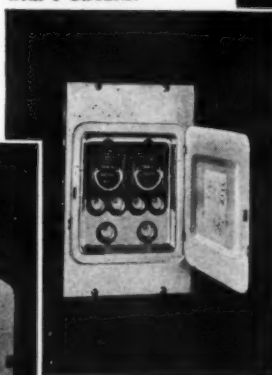
"What switch," say you?
These "PULL-OUTS", say
contractors!



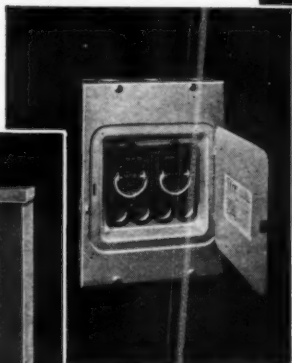
Cat. No. 258P
Metering equip-
ment—Main and
Range Switches.



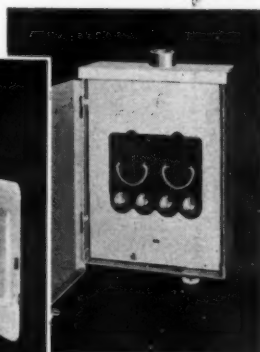
Cat. No. 74-6
60 amp. Main and
Range Switches
with 6 Circuits.



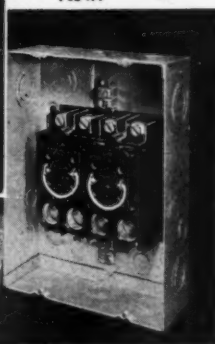
Cat. No. 74-4
60 amp. Main and
Range Switch, with
4 Circuits.



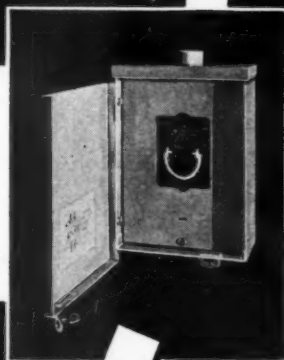
Cat. No. 52-4
60 amp. Outdoor
Main and Range
Switches with 4
Circuits.



Cat. No. 74-4
Interior — Solder-
less Connectors in
View.



Cat. No. 81
Outdoor — Ser-
vice Switch—
60 amp.



Compact, look swell, sold-
erless connectors, knuckle room
aplenty, ample knockouts, as easy
to install as hanging a picture.

Murray
SWITCHES

Get all
the facts
Now!

METROPOLITAN
DEVICE CORPORATION.

1250 Atlantic Ave.,
Brooklyn, N. Y.

Please send, free of charge, Murray
Switch Catalog.

Name _____

Company _____

Address _____

Cat. No. 72
Main or Range
Switch—60 amp.

125-250 V., 3 Poles,
2 Blades, 2 Cir-
cuits. S. N.



IT'S EASY TO

SEE

"ON" "TRIPPED" "OFF"

**WITH THE WESTINGHOUSE
MOTOR WATCHMAN
MANUAL MOTOR STARTER**

FOR MOTORS UP TO 7½ HP
CLASS 10-100

Easy To Install

Compact design but with ample wiring space. Concentric knock-outs on top, bottom and sides make installation easy. Top screw holes in back of cabinet are keyhole-shaped. Bottom holes oblong for quick lining up. Straight-through wiring—line to top—load at bottom.

Lower Maintenance

"De-ion" quenchers prolong contact life. Bi-metal provides unvarying accurate overload protection. Trip-free switch—cannot be held closed against overload. Quick-make, quick-break prevents "teasing". All metal parts tinned or cadmium-plated. Silver-to-silver, double-break contacts. Deep-drawn cover and contact inspection window on arc quencher make maintenance easy.

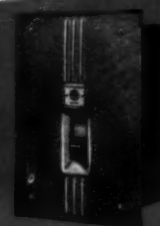
WESTINGHOUSE ELECTRIC & MFG. CO.
EAST PITTSBURGH, PA.

J-21137

"De-ion" Quenchers
Prolong contact life.

Bi-Metal Overload
Protection. Snap-action
disc. Unvarying
calibration.

Self-indicating.
Quick-make, Quick-
break Toggle action.



Flush mounting



Watertight



Explosion-proof

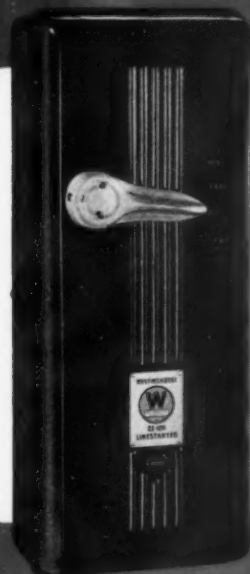
Westinghouse



FOR PRODUCTION INSURANCE

buy Westinghouse

**TIME SAVERS
FOR INDUSTRY**



**WESTINGHOUSE
COMBINATION LINESTARTER**

**For Motor Control and Circuit
Protection**

CLASS 11-206

Magnetic motor starter—motor-circuit switch—motor overload protection—nofuse circuit protection—all in one unit. Bi-metal gives permanently accurate overload protection. "De-ion" quenchers protect contacts—save maintenance. Four-in-one Unit saves installation time—saves space—saves wiring—provides greater protection for operators.



**WESTINGHOUSE
SAFETY SWITCH**

For Circuit Protection

Diamond-pointed break jaw and extended-blade construction prevent burning and beading of contacts. One-piece copper construction saves money by preventing power loss. Quick-make, quick-break on Types A and C. Ample space for wiring. Solderless lugs. "De-ion" arc quenchers on 575-V switches.



**WESTINGHOUSE
AB-1 BREAKER**

For Circuit Protection

Eliminates switch and fuses. Bi-metal overload protection. "De-ion" protection for contacts. Saves maintenance time and production time—circuit outages can be restored by operator. No live parts exposed. Door opens only when switch is in "Off" position. Occupies approximately 40% less space than switch and fuses.



**WESTINGHOUSE
"DE-ION" LINESTARTER**

**Magnetic Across-the-line
Starter**

CLASS 11-200

Push-button operated—built-in or mounted separately. Small, compact construction saves space. Bi-metal overload protection—hand or automatic reset. "De-ion" protection for contacts reduces maintenance. Vertical magnet operation speeds contact opening and prevents accidental operation.

Call your nearest Westinghouse Sales Office or Distributor

Motors and Control

BULL DOG PIONEERS AGAIN!

This end view of a three phase unit of "LO-X" shows how reactance drop is kept to a minimum through extremely close spacing of bus bars—the air gap being supplemented by a sheet of woven glass insulation.



New! "LO-X" BUStribution DUCT Low Reactance Design—Reduces Voltage Drop

No longer need you "starve" your motors—or "heat your building with electricity." No longer need you pay for current "lost in transit."

Now voltage drop due to reactance can be cut to a minimum by using Bull Dog's new "LO-X" BUStribution DUCT—a new product of more than fifteen years of pioneering in the field of flexible electrical distribution.

For installations such as welders, induction ovens and furnaces, especially at low power factors, "LO-X" BUStribution DUCT affords a high load capacity, better voltage regulation, and consequently more efficient and uniform operation.

In addition, "LO-X" is particularly desirable for long feeder runs at usual power factors, providing an economical means of

reducing line drop below a point made possible by any other system.

"LO-X" BUStribution DUCT is available in from 500 to 4,000 amp. capacity, 600 volts or less, single phase, three phase, and three phase 4 wire. It may be used alone or combined with Standard "Plug-in" type BUStribution DUCT.

Write for detailed information, or better yet, ask to have a Bull Dog sales engineer call on you.

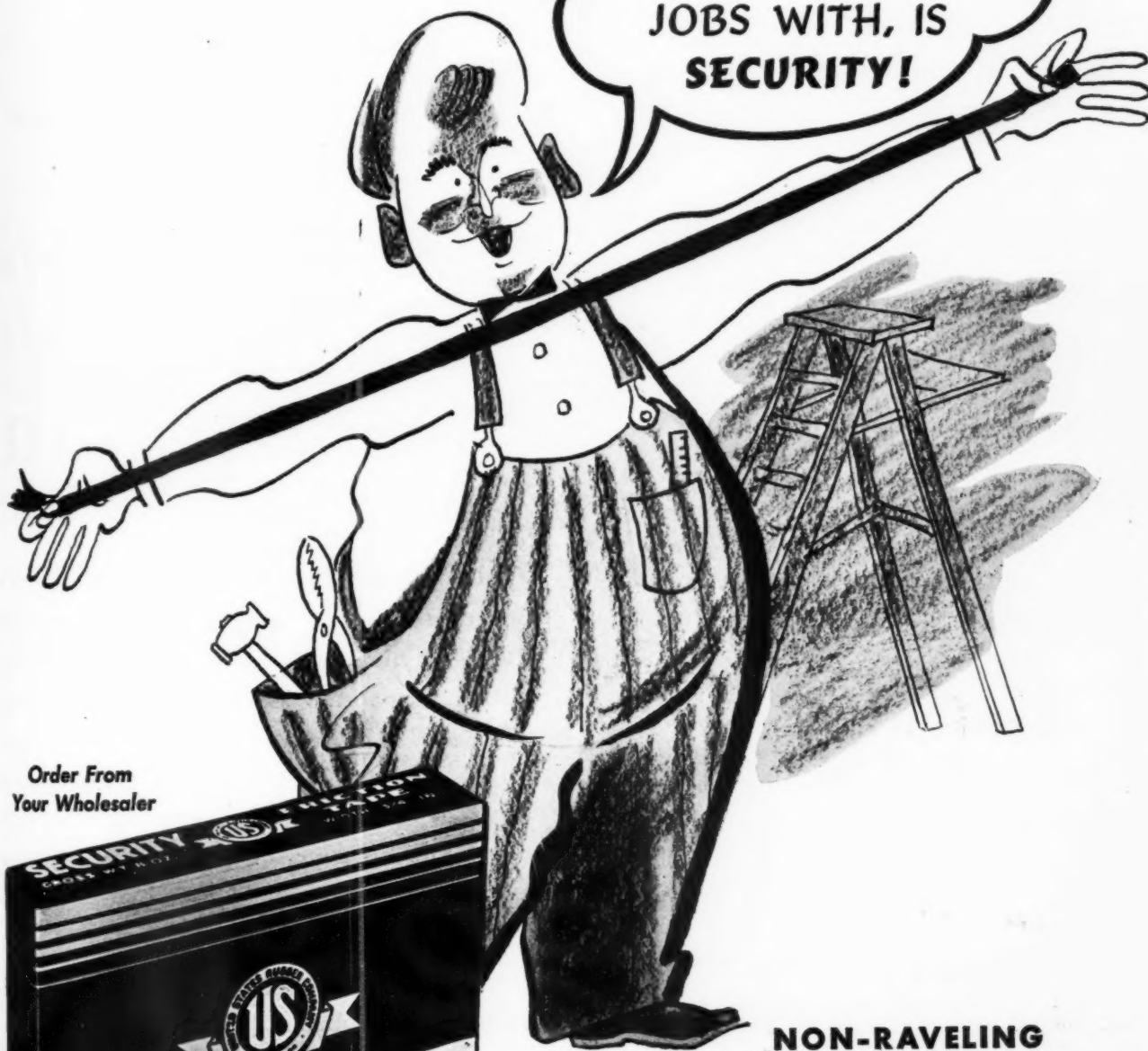
Originators of Flexible Electrical Distribution Systems



MANUFACTURERS of Vacu-Break Safety Switches, Panelboards, Circuit Master Panels, Switchboards, Duct Systems—FOR LIGHT AND POWER

AS EXTENSION
CORD ELMER SEZ:

I'VE BEEN CONNECTING 'EM
UP FOR A LONG TIME AND
THE BEST TAPE I'VE FOUND,
TO WIND UP MY
JOBS WITH, IS
SECURITY!



Order From
Your Wholesaler

**NON-RAVELING
STRAIGHT TEARING
HIGH TENSILE STRENGTH
HIGHLY INSULATING
STRONG ADHESION**



UNITED STATES RUBBER COMPANY

ROCKEFELLER CENTER • NEW YORK

ALSO MANUFACTURERS OF U. S. ELECTRICAL WIRES AND CABLES

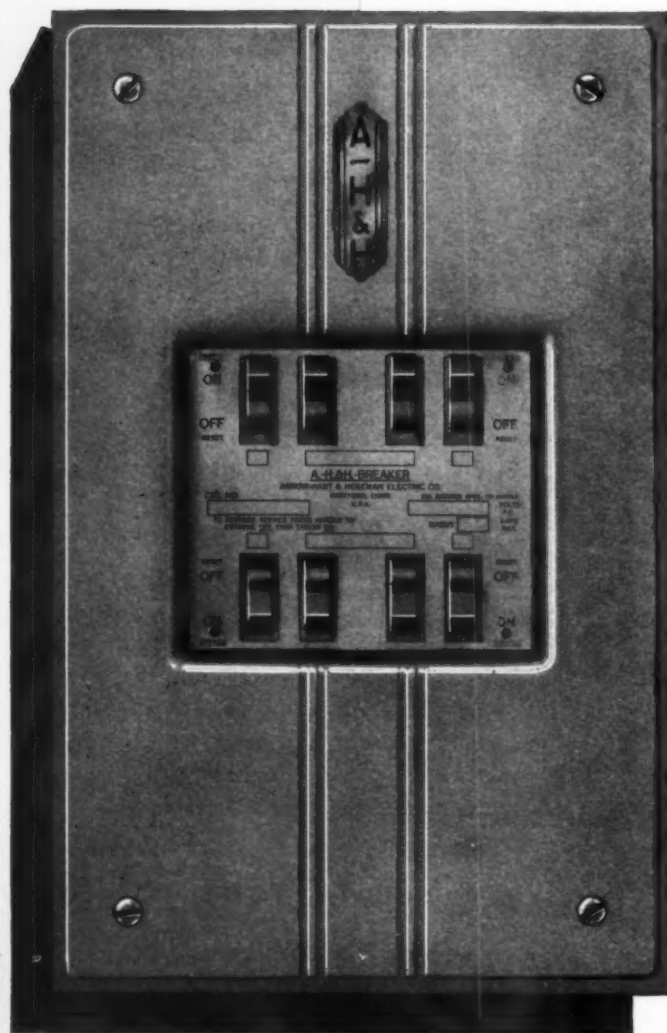
Electrical Contracting, May 1941

ARROW

New improved

BREAKERS

SIMPLIFIED LINE



No. 29086-F
Type "CB"
8 Single Pole
Flush Housing

*Interchangeable
stocks inaugurate
new Part Plan
to reduce your stock investment*

Order only the parts needed *first*; save carrying-charges on parts needed *later*! Breaker Boxes or Breaker Units (with covers) may be ordered separately as required. By ordering *boxes only* to be delivered for roughing in, the Contractor keeps *un-needed* material off the job at that stage. **THIS SAVES TIEING UP MONEY IN STOCK**; incidentally saves breakage and loss. When ready for the Breaker Units, the wiring job is so nearly done that your order can take account of any changes from original plan.

PACKAGED FOR USE AS NEEDED

One box may be used *interchangeably* with a number of breaker unit combinations, because they are catalogued and packaged separately. They may be ordered complete if so desired.

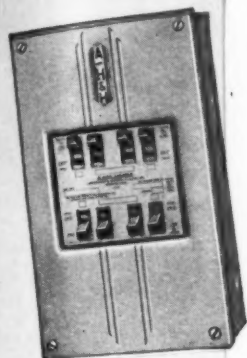
This stock-flexibility helps the Jobber too, in keeping his inventory more closely in line with *actual demand*.



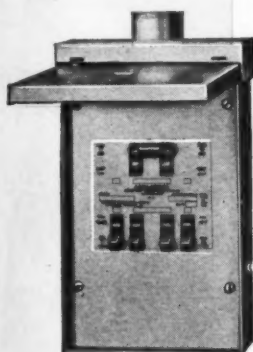
INDUSTRIAL CONTROL DIVISION

THE ARROW-HART & HEGEMAN ELECTRIC COMPANY, HARTFORD, CONN., U. S. A.

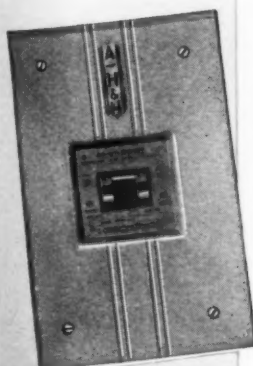
ARROW Breakers



No. 29088-S
Type "CB"
8 Single Pole
Surface Housing



No. 29054-R
Type "CB"
4 Single Pole
1 Double Pole
Raintight Housing



No. 29121-F
Type "C-1"
1 Double Pole
Flush Housing

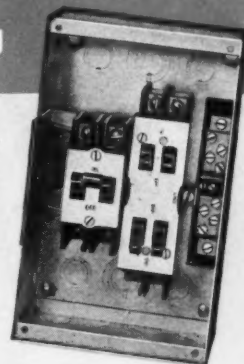
HEART OF THE BREAKER

It's the action of the Bimetal Trip that "makes or breaks" your Breaker. Its operation is made *dependable* by metals of exactly the right properties; by scientific design; by accurate calibration and by safeguarding against distortion that might alter its accurate setting.

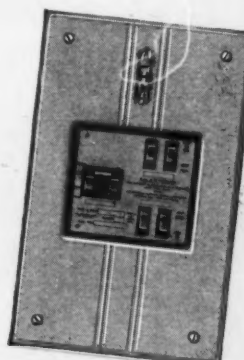
ARROW Breakers are IMPROVED Breakers in all these particulars. The all-important Bimetal Trip is supported and held permanently in place by *three screws*. This fastening holds the Bimetal intact against possible mechanical injury, distortion or strain . . . All ARROW Breakers are fully tested and approved by The Underwriters' Laboratories, Inc.

Send for complete-line Bulletin with simple Ordering Plan

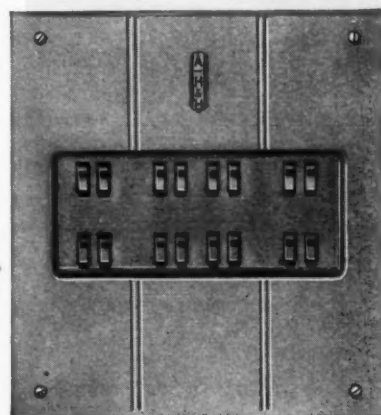
This plan permits the *simplest ordering procedure* in stocking Breakers for all common needs. Each shipping package is plainly marked with its own Catalog Number exactly as listed in our Catalog under the Part Plan; complete Breakers are identified the same way. Stocks may be easily checked; there are fewer items to order, and your reduced stock means a *minimum investment*. The special Bulletin offered here is your Condensed Catalog of this Line . . . the *KEY* to the Part Plan. Send for it and *save* all along the line.



Type "CBC"
4 Single Pole
with separate
Double Pole



No. 29143-F
Type "CBC"
4 Single Pole
with Separate
Double Pole
Flush Housing



No. 29099-S
Type "CB"
16 Single Pole
Surface Housing

INDUSTRIAL CONTROL DIVISION

THE ARROW - HART & HEGEMAN ELECTRIC COMPANY, HARTFORD, CONN., U. S. A.





Sangamo-

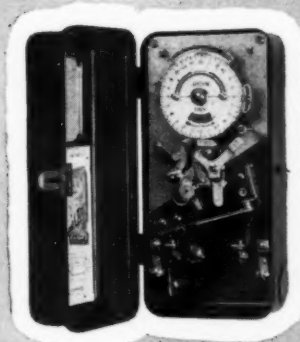
TIME-SWITCHES

CAN BE USED
AS A STEPPING
STONE FOR STORE
FRONT LIGHTING
INSTALLATIONS



Curtis Lighting Photo

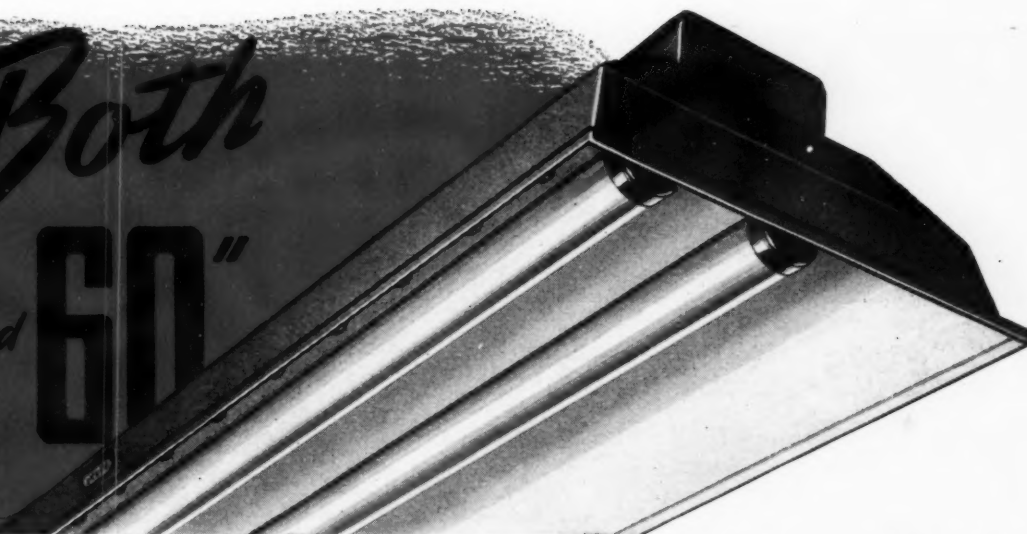
With business on the up-grade, many store owners are considering lighting modernization. Sangamo Time-Switches can be used as a stepping stone in obtaining this kind of work. The cost of a Sangamo Time-Switch is but a small expenditure to the store owner — yet, its benefits to him are profit-bearing because of increased window-circulation from regularly lighted show windows. The installation of the time-switch will acquaint you with the store owner's electrical needs, and give you the opportunity of selling him additional equipment, such as reflectors, fixtures, sockets and wiring — and all it takes to start the ball rolling is a Sangamo Time-Switch.



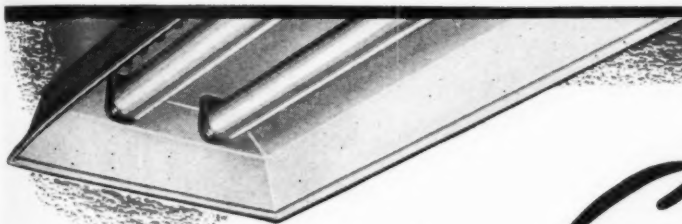
With this Form KAZ Astronomic Dial Time-Switch resetting is not required the year around. Saves time for busy store owners.

SANGAMO ELECTRIC COMPANY **SPRINGFIELD ILLINOIS**

NOW Both
48" and 60"



MAZDA Fluorescent TWIN-LAMP Lighting Units



BUILT TO
RLM
Specifications

UNIFORM QUALITY AND CONFORMANCE TO RLM STANDARDS CERTIFIED BY ELECTRICAL TESTING LABORATORIES

● These units open new opportunities for selling the most modern light conditioning to cover a wide variety of industrial interiors. They make possible efficient, economical use of the newest type of daylight-quality illumination . . . with soft shadows and new freedom from glare and heat annoyances.

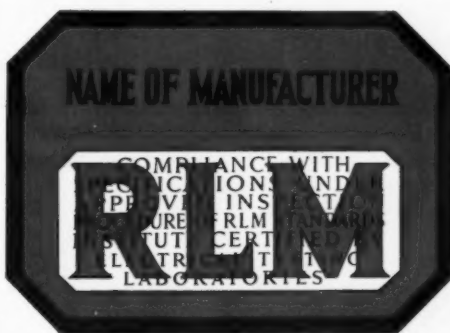
An RLM requirement for the new 60" Unit illustrated . . . typifying the completeness with which the RLM Specifications cover all design, construction and performance factors . . . is the use of apertures which direct 2½% of the light into the upper zone. This provides ceiling illumination that is uniform . . . free from shadows and bright striations. These apertures also provide ventilation . . . preventing substantial reduction in light output.

All Fluorescent lighting units built to RLM Specifications embody the following rigid lighting performance

standards . . . all basic to the best and most economical results with Fluorescent Lamps: (1) Quality and weight of the materials used in reflector and housing; (2) Quality in reflection factor of porcelain enamel; (3) Shielding angles; (4) Dimensions; (5) Contour; (6) Light output efficiency of reflector; (7) Location and spacing of lamps; (8) Ballast equipment. Furthermore, the complete unit

must be approved by Underwriters' Laboratories to meet National Electrical Code Standard requirements.

Continued compliance with the RLM Specifications by manufacturers of all RLM LABELED Lighting Units is assured by periodical rigid inspections at the plant of each RLM manufacturer; and through laboratory tests conducted by Electrical Testing Laboratories . . . an independent organization.



The Letters RLM Stand for Reflector and Lighting Equipment Manufacturers

RLM STANDARDS INSTITUTE

INCORPORATED

307 N. MICHIGAN AVE. • SUITE 1600 • CHICAGO, ILL.

THE CERTIFICATE OF



UNIFORM QUALITY

How to Keep Your Customers from Being **HOT AND BOTHERED!**

Cool Light

Cool Air

Recommend This Amazing New

Guth FLUORESCENT

Combination Lighting and Fan Unit

NOT HOT! Because GUTH Fluorescent Light is a *cool* light—75% cooler than ordinary light! And because the GUTHFAN circulates, from the floor upward, a scientifically-controlled current of 7° to 10° cooler air which “cools you all over”!

NOT BOTHERED! No blasts—no drafts—from the GUTHFAN! Desk papers stay put! And there's not the bother of poor lighting, reflections, shadows, or glare, either. Engineered GUTH Fluorescent Lighting, with ALZAK Aluminum Reflectors, provides light *right where it's wanted!*



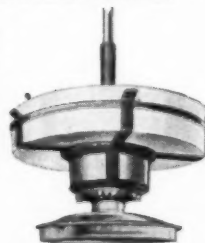
Move the Seashore & Mountains into the Office!

Business people know the sound value of working in complete comfort. They want the easy-on-the-eyes light, *plus* the cool, circulating air, that they can get through the engineered efficiency of this remarkable GUTH Fixture. Recommend GUTH Combination Lighting and Fan Units this summer!



Three lamps in a decorative White Opal Glass Bowl top this GUTHFAN to provide a beautiful combination unit for the customer who prefers incandescent lighting.

Here is another GUTH Combination Unit which offers modern design plus modern efficiency in lighting and cooling. White Opal Glass Bowl accommodates three lamps.



Al Zak, the kid with the extra punch, says: “ALZAK resists abrasion!”



EDWIN F. GUTH COMPANY

2615 WASHINGTON AVENUE • ST. LOUIS, MO.

Leaders in Lighting Since 1902

Guth



Ⓢ Busduct is installed in the Research Building, Georgia School of Technology, Atlanta . . . Architects: Bush-Brown and Gailey . . . Contractor: Mion Construction Company.

Industry turns to Busduct

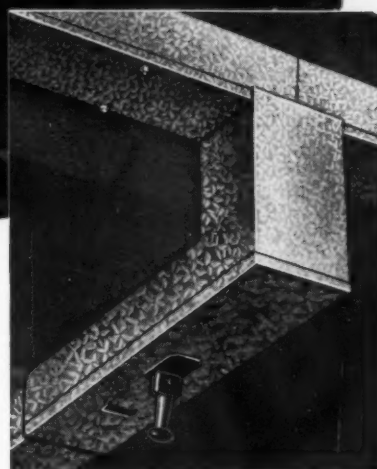
as the modern method for power and light distribution. Many educational, commercial and other types of buildings also are installing this compact, flexible and convenient distribution system.

Ⓢ Busduct affords great flexibility for machine layout. Time lost in changing location of machines is reduced to the minimum. Simply "move the machine — plug in — go!"

Both Feeder and Plugin types are made in standard 10-foot sections. Each section of the Plugin type is arranged with nine plug-in outlets on 12-inch centers. Suitable elbows, tees, end boxes, intermediate feed-in and feed-out boxes, are supplied to fit required space or position — whether on wall or ceiling.

The copper busbars are contained in enclosures of steel or aluminum. They are rigidly supported at 30-inch intervals by specially designed insulators that insure proper spacing — to meet the requirements of the National Electrical Code. Contact surfaces of connecting bars are silver-plated, to prevent oxidation. Designed for 2, 3 and 4 wire feeder systems; 250 volt DC, 575 volt AC, maximum.

Ⓢ Busduct is practically immune to deterioration. It may be taken down and installed in new positions, in the same or different buildings, as need may require. Extensions may be made readily to existing installations. Moderate first cost is combined with low up-keep.



A circuit breaker type tap-off unit where a Plugin Ⓢ Busduct connects with a Feeder Ⓢ Busduct.

Ⓢ Sales-Engineers can help Manufacturers, Architects, Engineers and Contractors with their Distribution Problems

Their long experience and training are at your service — without obligation. Write for the name and address of the one nearest you. Also, for Bulletin 61, which contains complete description, applications and detail drawings of Ⓢ Busduct . . . Frank Adam Electric Company, St. Louis, Mo.



Fluorescent at its Finest

by HYGRADE



- the pioneers

**OUTSELL YOUR
COMPETITION
with
MIRALUMES!**



World's only completely guaranteed fluorescent lighting fixtures—ready for immediate delivery!

NO other contractor competing on the same job can possibly match your "selling story" . . . when you're selling Hygrade MIRALUMES!

For no other fluorescent lighting fixtures *in the world* combine all the advantages of MIRALUMES!

Get a load of this!

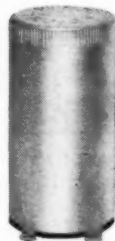
You can offer prospects *finer light*, with MIRALUMES (Hygrade's patented lamp coating) . . . *positive starting and re-starting* (Hygrade's patented Mirastat starters) . . . lower maintenance (Hygrade's easily demountable reflectors and sturdy lamp holders) . . . plus a complete *guarantee* that assures complete satisfaction!

You're selling quality!

Fewer complaints and call-backs—more time for more sales—with MIRALUMES. They're quality

manufactured . . . better designed and engineered throughout . . . wired and ready to install, complete with superior-quality Hygrade lamps . . . Underwriter's Laboratory approved . . . high power factor . . . starters easily accessible . . . eligible for FHA financing!

Write today for MIRALUME catalogue, prices, discounts. Dep't EC5, Hygrade Sylvania Corp., Ipswich, Mass.



**GET BETTER PERFORMANCE
WITH THE NEW MIRASTATS!**

Here's the finest fluorescent lamp starter on the market . . . now available to all fluorescent users . . . the new Hygrade Mirastat! Assures positive starting and re-starting—longer lamp life—performance that's *dependable*!

Hygrade MIRALUMES

Complete with Superior Hygrade Fluorescent Lamps

Hygrade Sylvania Corp., Est. 1901. Also Makers of Hygrade Fluorescent and Incandescent Lamps and Sylvania Radio Tubes.

The XYZ
ELECTRICAL CONTRACTING CO.
W. T. JENKINS, P. A.

Bill Jenkins
writes an order

Will he split this order into 14 parts among the 14 manufacturers spread all over the map? He will not.

Will he need to place *any* part of the order direct with *any* manufacturer? No. Thanks to the wholesale system of distributing electrical products, he doesn't have to.

Without delay, he will turn over the complete order to his Jobber

- the Jobber who carried his account back in '33, and helped to save him from going through the wringer
- the same Jobber who only last month ransacked the county for certain Defense material that Bill Jenkins says saved his life.

Bill Jenkins' Jobber and the T & B Distributor are one and the same person. His services as a Wholesaler are indispensable to Bill Jenkins and to us. He puts our manufactured products into Bill Jenkins' hands quicker, and at lower cost, than we could ourselves.

Is it any wonder that we "advertise his services to the world"? — and that we support him with our 100% Distributor, One-Price Policy; in short, back him up with The T & B Plan for Doing Business?



THE THOMAS AND BETTS CO., INC.

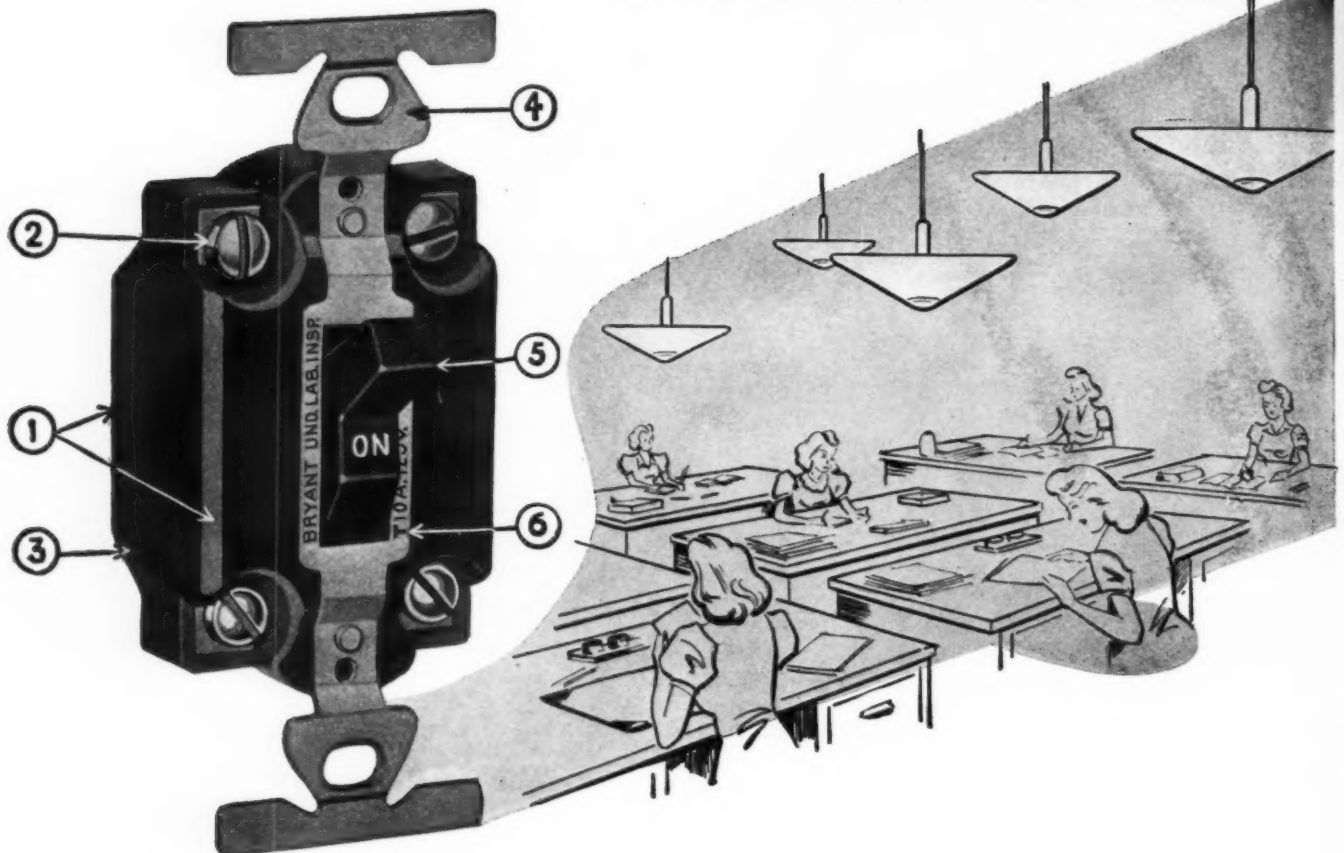
MANUFACTURERS OF ELECTRICAL FITTINGS SINCE 1899

Factory, Engineering and Executive Offices, Elizabeth, N.J. • Sales and Service offices in 23 leading cities

T & B Distributors cover United States and Canada

EVERY OUTLET DESERVES

A BRYANT DEVICE



NEW SHALLOW 20 AMPERE SWITCHES

All the Time-Proved Features Plus Important New Ones



1. 1½ INCHES DEEP—Fits shallow boxes.
2. EASY TO WIRE—Large binding screws recessed to facilitate wiring.
3. BAKELITE ENCLOSED—Fully enclosed in rugged bakelite.
4. INSULATED YOKE—One-piece design yoke, with plaster ears. Completely insulated from mechanism.
5. UNBREAKABLE PLASTIC HANDLE—Made in Brown, Ivory and Black. Also available in Lock and Momentary types.
6. FULLY APPROVED—U. L. "T" Rated. Conforms with Federal Specifications.

CATALOG NUMBERS

Single-Pole . . . No. 5861	Three-Way No. 5863
Double-Pole . . . No. 5862	S. P. Quad. Break . . . No. 5866

The new Bryant Shallow 20-Ampere Switches give extraordinary performance at ordinary prices in both industrial and commercial service. Write for new device page 50-B.

*The Bryant Electric Company
Bridgeport, Connecticut*



SOLD THROUGH ELECTRICAL WHOLESALERS NATIONALLY

Since 1901 a subsidiary of WESTINGHOUSE
ELECTRIC & MANUFACTURING COMPANY

Electrical Contracting

With which is consolidated The
Electrict and Electrical Record
Established 1901

Member A.B.C. - Member A.B.P.

EARL WHITEHORNE
Editor

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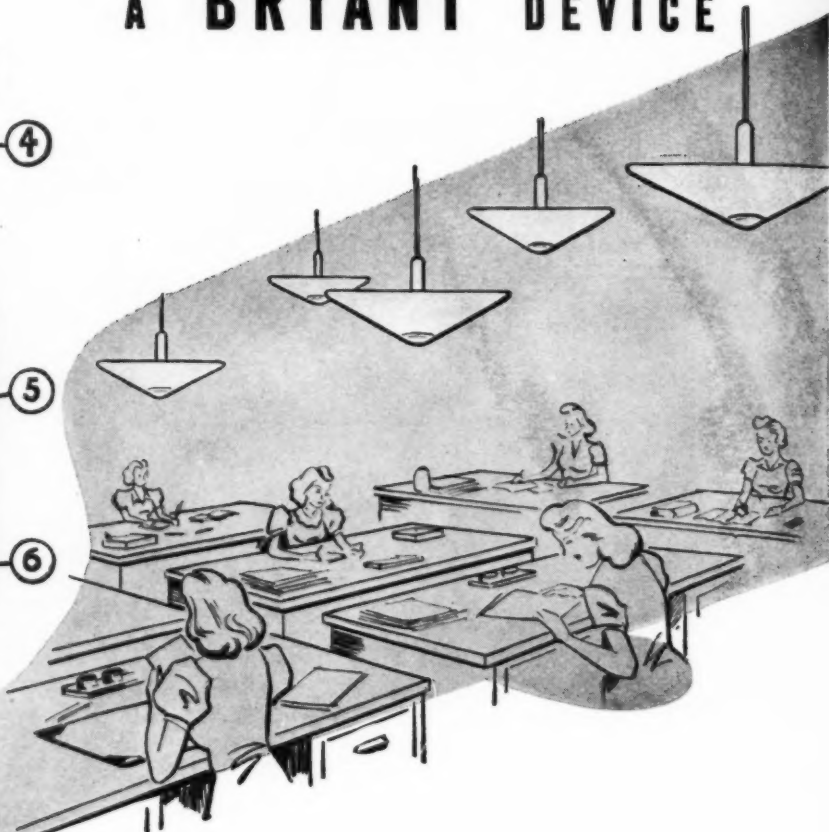
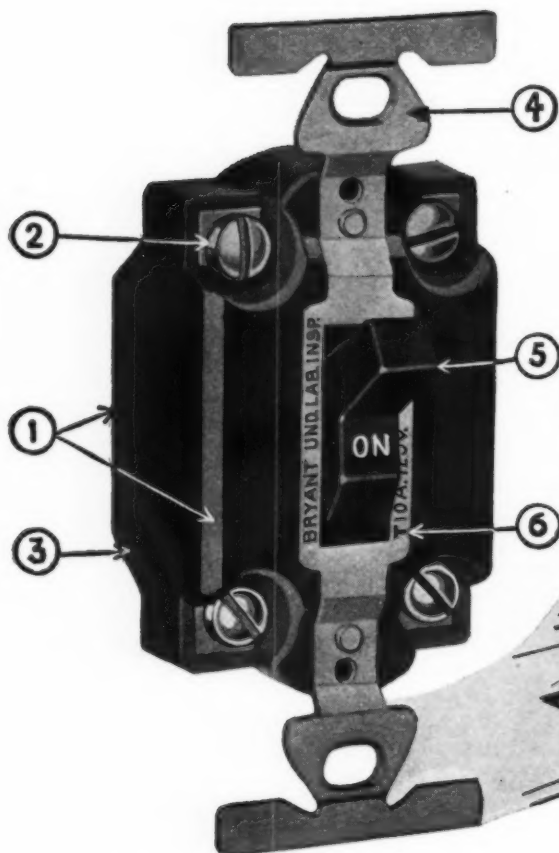
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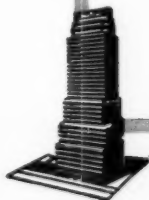
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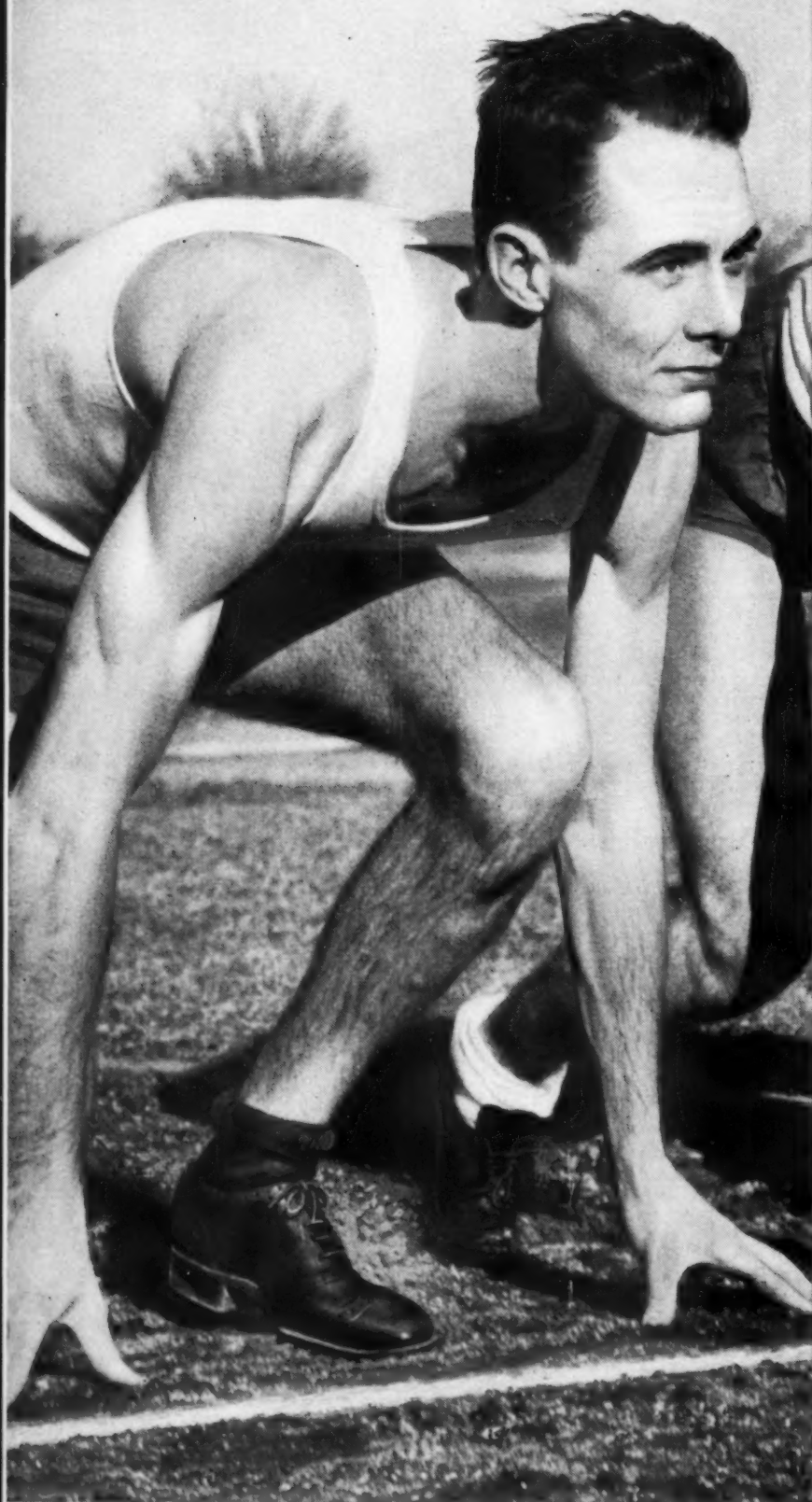
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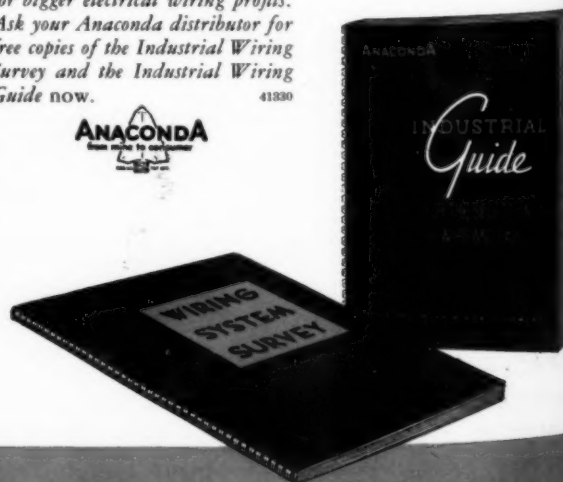
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41330



USE MODERN IMPROVED

Anaconda Wire & Cable

MAY, 1941

A Sorry Joke

IN MY BERTH THE LIGHT WAS DIM. It was the one o'clock out of Detroit, the night of Henry Ford's great party to Edison. The next car was full, the porter in bed in the wash room. I sat in the corner basin, my feet in the next basin, writing on a pad propped on my knees, when in popped Will Rogers. He laughed at me but slid down in the other basin and we talked for an hour. His wit was sparkling.

WILL ROGERS WAS A POWER in American opinion because he could laugh at things going wrong and make them ridiculous. I wish he had had a little time for the electrical industry! He could have made some fun over a number of things—the residential lighting fixture situation, for example.

THE POPULARITY OF "FIXTURES" slowly died. Many houses today install almost none of them. Portable lamps have outrun ceiling and wall fixtures in both decorative interest and lighting values. Contractors have quit pushing fixture outlets and put in receptacles.

WELL, I.E.S. LAMPS HAVE SHOWN that good lighting can be sold. Now ceiling and wall fixtures are to be "certified" for illuminating efficiency. But will that sell them? Two things stand in the way—

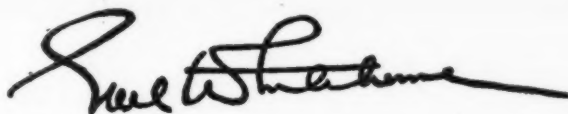
One—If people pay more for chandeliers and brackets they will want to be able to take them along when they move. This equipment must become personal property—not "fixtures."

Two—If such certified fixtures are to be used, ready outlets must be provided by the contractor when the house is wired.

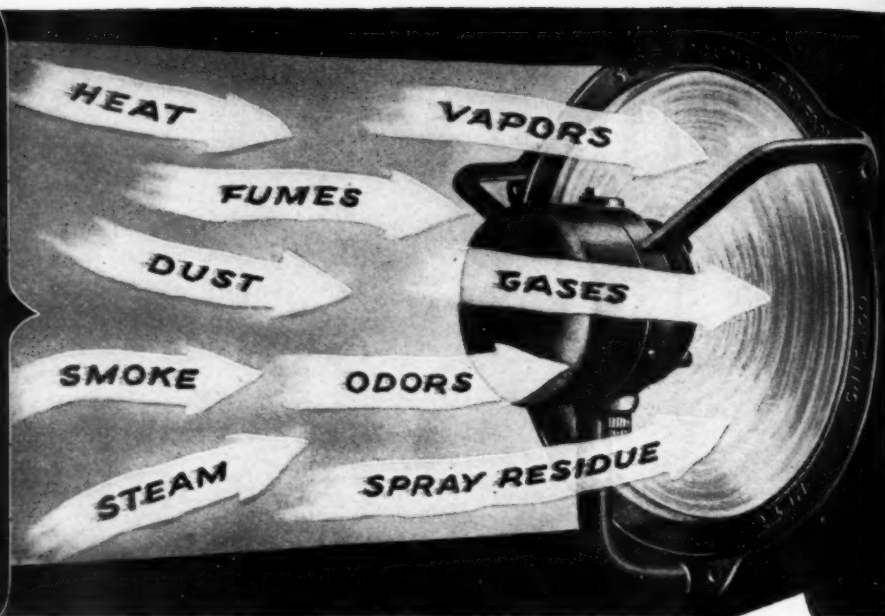
FAN OUTLETS ARE NOW IN COMMON USE, that provide a hook and a place to plug in. Lighting fixtures must be handled the same way. They must hook onto the wall or ceiling and plug in—removable—interchangeable. And it must be made profitable for the contractor to install these fixture-hooks and also to sell the lighting units.

AT PRESENT, THE ELECTRICAL CONTRACTOR apparently is not provided for in the fixture industry's new program. If so it does not stand out. Fixtures are blocked today, they say, because contractors do not provide outlets for them. And contractors probably will not become much interested until "fixture-hooks" can be installed as a finished job—with profit.

DOES SOMEBODY SAY—"It's been tried and failed!" Sure! That's really the joke of it. For if the "Elexit" idea had been perfected and pushed through, the fixture business would have been saved. The contractor can help restore it.



**CLEAR OUT
ALL THESE
FOR
Extra
PROFIT**



Peak production in any working place calls for clear eyes, clear heads and comfortable surroundings. When you install modern ventilating equipment to get rid of heat, smoke and all the rest, you clear the way for maximum production on the part of your industrial customers, and extra profit for yourself.

What's more, when you put your needs for ventilating fans and equipment up to GRAYBAR, you get these three *extra* advantages:

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***Free Bulletins*
HELP YOU SELL
BETTER VENTILATION**

Write today for descriptive bulletins giving application specifications and performance features.

ILG Propeller Fans... powered by the quiet, self-cooled ILG motor. Models for permanent or portable installation; for problems involving smoke, explosive fumes and the like. Ask GRAYBAR for Catalog No. C-53. It gives you the complete story.

ILG Blowers... Long-lived, quiet units in a wide range of capacities. Remember, GRAYBAR specialists are always "on call" to help you in selecting an installation tailored to the needs of the job.

G-E Wall Fans, Pedestal Fans... the complete line of G-E fans, backed by the reliable G-E trademark, is available "via GRAYBAR." They include such features as Vortalex Blades and self-aligning bearings. For full details on any type of G-E fan, write to GRAYBAR for 1941 G-E Fan Catalog.

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LIGHTING the NATIONAL AIRPORT

How light controls airline traffic at the newly constructed air terminal at the Nation's Capital. An ingenious signal light system directs landings and take-offs of night planes. Many of the ideas are applicable to smaller fields.

by August Eckel

"FLIGHT SEVEN approaching National Airport. Will be over field in two minutes." With these words ringing in his ears, the control tower operator watches for the position lights of "Flight Seven." And with a flip of a switch, he turns on a large green arrow indicating the approach and runway the incoming liner is to use. Simultaneously, red signal lights hold outgoing planes on taxi strips. The same switch floodlights and outlines the designated runway.

The giant airliner lands. The floodlights go out. A series of blue taxi

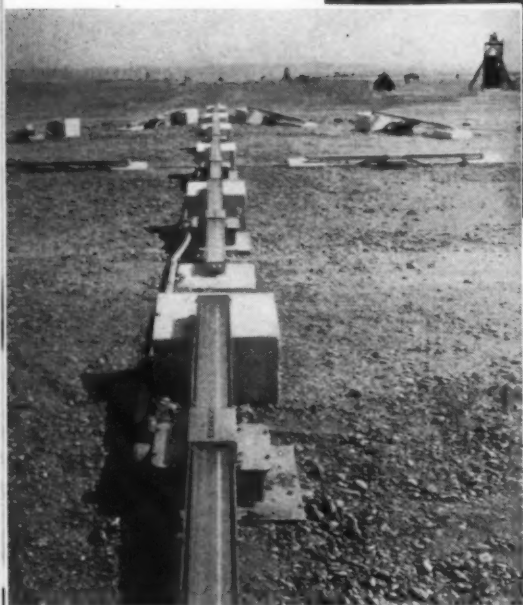
guidance lights then go on, to guide the plane from the runway to the brightly lighted apron of the terminal building. Thus the modern airliner is guided with clockwork precision to a perfect night landing. And it's all done with lights.

This is what happens at the newly constructed Washington National Airport at Gravelly Point, Va. The airport is just across the Potomac from the Capitol and at the foot of historic "Abingdon", in 1677 home of John Alexander. The task of designing this complicated, yet easy-to-operate, light-

ing and control system was handled by H. J. Cory Pearson, electrical engineer for the Civil Aeronautics Authority and by the Westinghouse lighting engineers. Installation of the field lighting was done by the Howard P. Foley Company, Inc.; the terminal building and hangar power and lighting by Harry Alexander, Inc., both electrical contractors of Washington, D. C.

Power enters the central heating building through two independent underground 22 kv. feeders, each fed from a separate utility line and operated in parallel. Each feeder is large enough to take the entire airport load if necessary, and terminates in a 2000 kva, 22,000/2300-volt, three-phase transformer in an open vault outside the building. Provision is made for two additional future incoming feeders.

The secondary 2300-volt feeders go through the main cubicle type switchboard in this building, underground to the transformer and electrical equipment rooms in the terminal building. Here certain feeders go on through



PULLING CABLE for contact light circuits on taxi strips. Truck will leave and go to handhole 200-ft. away to pull while this crew feeds the cable. Contact lights are to right of handhole.

FLUORESCENT ARROW and cross for control of air traffic consists of 16 sections mounted at a 15 degree angle with the ground. Green fluorescent elements form the arrow; flashing red ones the cross.

protective equipment to feed the 2300-volt radial underground distribution for field lighting; also for the large air conditioning, fire pump and fan motors in the terminal building. Other feeders terminate in two 500 kva., 2300/208-volt three-phase network transformers with network protectors. They feed the 120/208, 3-phase, 4-wire systems for terminal building and hangar power and lighting.

An emergency stand-by gasoline driven generator set, automatically connected to the incoming feeders, serves landing area lighting, radio and ample emergency building lighting. If one feeder fails, the set automatically starts and runs idle. When the second feeder fails the load is automatically transferred to the emergency set.

Field and Runway Lighting

In general, all field, runway, traffic control lighting, telephone, and lighting control circuits are run underground with lead covered cable, in fibre conduit. This provides maximum protection, flexibility and facility for repairing and replacing cables.

Boundary lights of the series cone type, spaced 250 feet apart, outline the periphery of the airport, which covers a total of 729 acres. They have white prismatic globes to concentrate the light. They are fed alternately from two series circuits, protected by separate regulators in terminal buildings.

Each regulator has relay protection from accidental open circuits. Each boundary light base has a disconnecting

plug to break the circuit if the light is knocked over. The ducts are connected by adapters and conduit nipples direct to the disconnecting boxes.

Obstruction lights are mounted on the buildings, hangars and the tops of the runway floodlights. Those on the hangars are fed from the building panel and controlled by a relay in the boundary light circuit. Those on the floodlights are fed by series-to-multiple transformers in the boundary light circuits. These lights are double units with each side fed from a separate boundary circuit to insure against a total failure.

A 300 millimeter beacon on top of the control tower flashes a green code signal. This identifies the airport and gives its exact location.

A ceiling projector is mounted about 1000 feet behind the administration building. It projects a narrow beam of light vertically in the air, enabling

CONTROL CENTER is this desk type board where four switches control 135 field lighting circuits. Simulated runways light up to show dispatcher which runway and field lights are burning. Board is not yet complete.



the ceiling height to be determined by simple triangulation.

The runway lighting consists of floodlights and contact lights. The landing area covers 556 acres and provides four runways, the smallest being 4,100 feet long and 150 feet wide; the largest, 6,855 feet long and 200 feet wide. Each runway is floodlighted from the approach ends by two 3000-watt, 32-volt projector floodlights, one on each side of the runway and far enough away from it to form no obstructions. They are mounted six feet above the runway level. Each pair of lights is on a separate control.

These floodlights are fed by the 2300-volt underground radial distribution system terminating in one underground transformer vault at both ends of each runway. Each vault forms the base for one of the lights. They contain 2300/32-volt transformers for the floodlights as well as the 2300/120-volt transformers feeding the taxi guidance,



CONTACT LIGHTS are fed from adjacent flush pre-cast handholes. These units are the red and green combination at the intersection of the taxi strip and runway. They control planes taxiing to runways.

range and traffic control lights. Each vault is approximately 5-ft. by 6-ft. by 6-ft. high and is completely waterproofed inside and out. It has a telephone connection to the control tower.

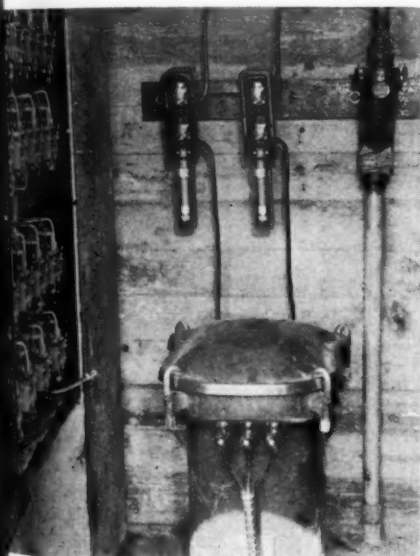
Contact lights, set flush in the ground, are spaced about 200 feet apart, directly opposite each other adjacent to both edges of all runways. The units are of the series type and concentrate the light up and down the runway at a 4 to 6 degree angle above the horizontal. Series circuits are used on these and the boundary lights to provide better service, reduce outages and to operate all units at the same brightness. Only the runway contact lights on one runway can be operated at one time. Duplicate controls are provided. For a distance of 1500 feet from the end of each runway these contact lights have yellow split filters to prevent taxiing planes from overrunning the end of the runway. Connections from the duct lines to the units are made through pre-

culits fed from the 120-volt bus in the runway transformer vaults.

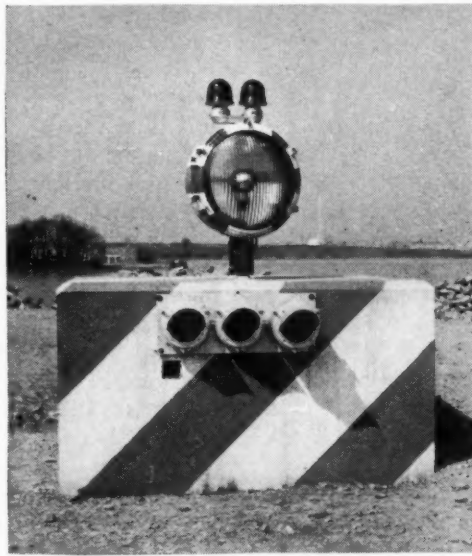
The air control signal consists of a 90-ft. gaseous type luminous tube green arrow with a similar 90-ft. red cross superimposed on it. Six of these units are mounted at a 15 degree angle to the horizontal on the axis of approach at both ends of each runway. Two units of incandescent type, consisting of multiple red and green contact lights are mounted at the ends of the East-West runway, because of the limited runway end space.

A green arrow indicates a clear runway and the approach an incoming plane should use. The flood and contact lights of this runway will also be lighted. If a take-off is being made the dispatcher turns on the red flashing cross, warning the incoming plane to stay aloft until a green arrow comes on.

Associated with these air signals are a group of traffic lights to control plane traffic on the ground. These consist



Vault interior contains transformers, relays, circuit breakers and flasher equipment to control 32-volt floodlights and 120-volt traffic and runway lighting. All lights are operated from control tower.



Light for guidance is provided by this typical group of floodlight, obstruction lights and ground traffic control lights, all mounted on a runway transformer vault. Narrow beam green traffic light is at right.

cast concrete handholes and conduit nipples.

Range lights at the ends of the runways are flush contact lights with green filters. They are coded with five lights at each end of one runway and on the others four, three and two respectively. Four lights can be used on each end, if desired.

The new traffic lighting system is designed to control air and ground plane traffic in much the same manner that traffic signals control city automobile traffic. All units are on multiple cir-

of traffic light standards, similar to street traffic lights, mounted on the floodlight supports. Each unit consists of a red "stop" light and a green "go" light, both hooded and visible only to planes taxiing to the runway. A narrow beam green "go" light mounted at the far end of the runway is visible only to pilots waiting to take-off. This prevents the reception of a "go" signal by a pilot at the wrong end of the same runway.

Taxi guidance lights are flush con-

(Continued on Page 75)

EQUIPMENT INSTALLED

- 5—7½ kva, 2300/120/240 volt transformers
- 1—10 kva, 2300/120/240 volt transformer
- 2—15 kva, 2300/120/240 volt transformers
- 8—7½ kva, 2300/32 volt transformers
- 8—Remote control cabinets
- 16—Westinghouse Type CAG-25, 3,000 watt, 32 volt floodlights
- 16—Duplex obstruction lights
- 8—Westinghouse Type RCOC oil switches
- 32—Westinghouse Type ES cutout type disconnects
- 16—Series-multiple transformers
- 8—Panelboards (load centers)
- 72—Series cone type boundary lights
- 5—Series type flush boundary lights
- 34—Series type flush range lights
- 174—Series type contact runway lights
- 88—Multiple type contact taxi lights
- 1—Coiling projector
- 14—Multiple type contact red traffic lights
- 14—Multiple type contact green traffic lights
- 8—Traffic light assemblies for runways
- 8—Code Flashers
- 2—Red cross and green arrow units of incandescent type
- 6—Red Cross and green arrow units, of gaseous luminous type
- 4—Electric smoke generators
- 1—Auxiliary code beacon
- 1—Wind vane with obstruction light
- 1—Anemometer with obstruction light
- 1—Control desk
- 1—Selective auxiliary contactor panel with about 560 sets of contacts
- 4—Constant current regulators
- 2—3 kva, 2300/120/240 volt transformers
- 1—Set of miscellaneous relays and oil switches
- Additional miscellaneous equipment for incoming feeders

MATERIAL INSTALLED

- 95,000 ft.—3-inch NoCrete fibre conduit
- 48,000 ft.—2-inch NoCrete fibre conduit
- 30,000 ft.—3-inch standard fibre conduit
- 125,000 ft.—Series cable
- 14,000 ft.—3-conductor, No. 8, 2500-volt, RLC cable
- 9,000 ft.—2-conductor, No. 8, 2500-volt, RLC cable
- 600 ft.—No. 12 RLC wire
- 76,000 ft.—No. 8 RLC wire
- 43,000 ft.—No. 6 RLC wire
- 500 ft.—No. 1 RLC wire
- 5,500 ft.—500,000 CM RLC cable
- 38,000 ft.—control cable
- 2,000 ft.—1-inch galvanized conduit
- 12,000 ft.—1¼-inch galvanized conduit
- 17,000 ft.—1½-inch galvanized conduit
- 500 ft.—2-inch galvanized conduit
- 1,200 ft.—3-inch galvanized conduit
- 314 —Pre-cast concrete handholes



THIRTY YEARS ago Mrs. Anna A. Fagan helped her husband start a little motor shop. Under her sound business management the firm prospered and gained state-wide reputation.



IDEA MAN is Ellis M. Fagan, Jr., who, besides operating the business, is trained in law, represents his district as State Senator, a Reserve Officer in the Army Air Corps.

ONLY a pipe rail separates the winding lathe from a modern office area furnished in chromium and leather—and the effect is not unsightly. For at the Fagan Electric Company in Little Rock, Arkansas, the shop gets the same housekeeping as the office. The emphasis on neatness and orderliness is a by-product of carefully planned shop layout and efficient production methods.

For 30 years this shop has been under the management of Mrs. Anna A. Fagan. And for the last seven years, Ellis M. Fagan, Jr. has been in charge and a state-wide reputation and continuous growth has required shop expansion four times. Again, Fagan reports, plans are underway for a new and larger shop.

Not content with simply rewinding and repairing motors, the Fagans have gone far afield in an effort to study their customers' industrial service problems. They want to find where they can serve in a way that will benefit the customer and contribute to the growth of the organization.

Specializing in

Outstanding for line production methods on transformer rewinds and fine shop housekeeping, the Fagan Electric Company of Little Rock creates its own market by meeting customers' problems.

Fagan found, for example, that utilities want their transformer repairs made with factory reliability and efficiency, with speedy work to permit a minimum inventory of spare transformers. The Fagans examined the potential market for transformer rewinds in the area. They found it represents a steady volume of interesting proportions. Factory winding methods were studied and the shop organized and equipped to handle transformer rewinding on a production basis.

Under contract with utility companies, transformers are picked up at the customer's storeroom and brought into the shop. At the receiving platform they are tagged and stacked. In an area partitioned off from the main shop, strippers dismantle the transformers and remove the old coils. All of the shop's dirty work such as stripping and cleaning is done in this area. A convenient mono-rail hoist allows one man handling of the heaviest equipment.

Work Allocation

Work is allocated by job sheets. The winders start with the data sheet, work steadily on the coils entirely to specification. Another crew handles vacuum impregnation and assembly. New leads, insulators and terminals are installed where required. The tanks get a thorough cleaning and a prime coat of paint before test. After the routine test of double the voltage plus 1,000 volts, the transformers get a finished coat of paint and are returned to the shipping area for delivery to the customer. A batch of 25 to 30 transformers will go through the shop in about one week on regular schedule. Rush jobs can be put through in three days.

Normally, under the repair contract, a continuous flow of transformers is rolling through on a regular schedule.

This permits a very close scheduling of each operation and a cost saving balance in the production line.

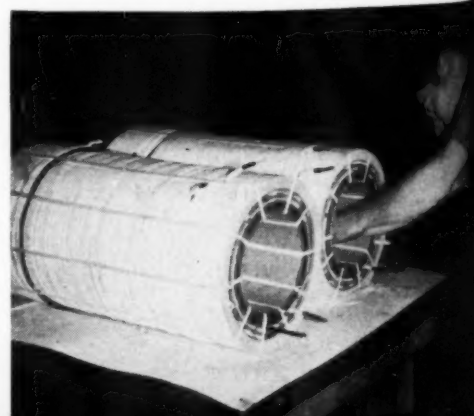
Close control of methods and careful selection of high quality insulating materials has set an enviable performance record on the rewinds. They claim that in seven years not a single job has come back to the shop as a result in failure of workmanship or materials.

Transformer business volume runs \$4,000 to \$5,000 a month. In the last seven years approximately 6,000 transformers have gone through the shop. Three men handle the winding lathes, three men handle test and assembly and two men take care of cleaning and stripping.

Integral horsepower industrial motors are handled with the same emphasis on system and orderly procedure. Cleaning and stripping is completed before the motor reaches the main shop. An orderly array of benches, coil winders and coil formers take care of the larger motors. This department operates under a separate foreman with three or four mechanics. The adjoining machine shop is equipped to handle all types of mechanical repairs.

In outlying communities in this part of the country, industrial plants with skilled electrical maintenance crews sometimes prefer to handle their own

ALL SIZES from 1½ to 500 k.v.a. units are handled in the line. These coils are for a 100 k.v.a. single phase 33,000 volt unit



n Transformers

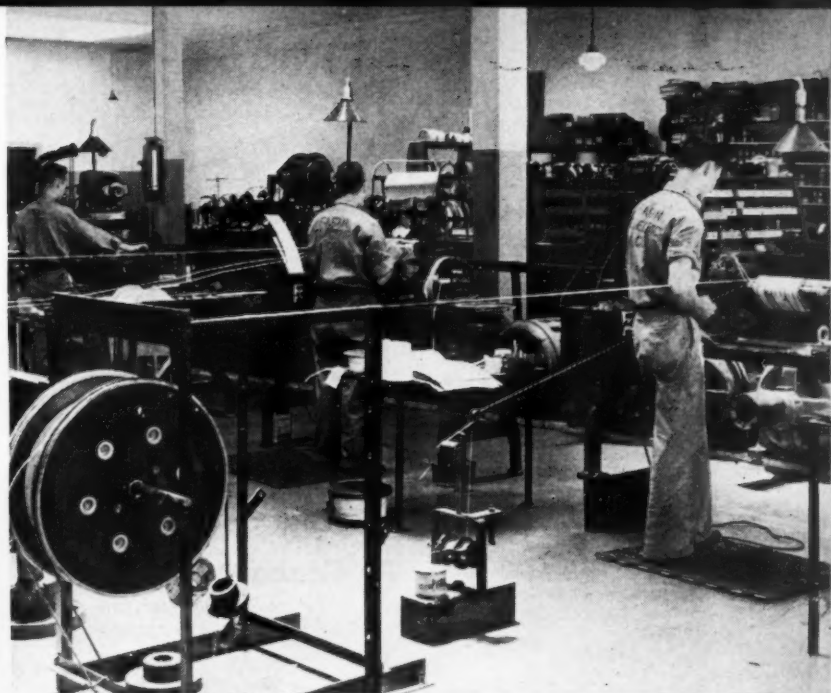


FINISHED COILS are formed and spread on a modern coil spreader. Precision equipment permits working exactly to specifications.

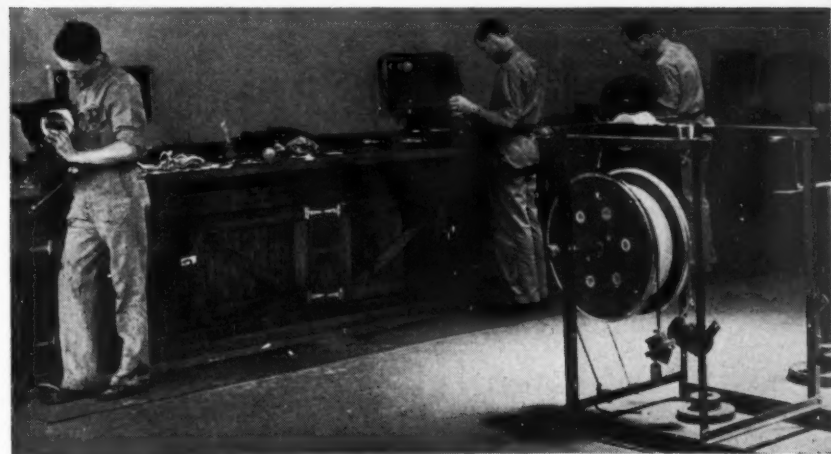
repairs on large units. But Fagan finds a way to get business there too. He offers the facilities of a coil winding department, winding and forming coils to motor specifications. Finished coil sets complete with slot insulation are packaged and shipped to these customers on a rush schedule. "If we learn the customer's problem, we can always find a way to serve him," Fagan says.

Fractional horsepower business is handled profitably by streamlining routine and standard price schedules. Small motor work is carried on in a separate department where all the equipment, tools, stock and parts are carefully organized. Authorized service is handled through dealers on Emerson, Delco and Sunlight motors. The same

FINISHED COILS are lined up ready for compounding and assembly while transformer cases undergo cleaning and painting.



TRANSFORMER COILS are wound to specification on speedy lathes. The steady flow of production gives these operators an opportunity to develop a high degree of skill and speed in this operation.



BENCH ASSEMBLY and test of industrial motors is handled with orderly bench equipment. Dirty work, cleaning, stripping and baking is kept in a separate department away from the main shop.

facilities are available for any make of fractional horsepower motor.

Repair prices are quoted on three classifications; minor repair, major repair and complete rebuild. On a conventional $\frac{1}{2}$ hp. washing machine motor, split phase, minor repairs include all repairs that do not require winding. Major repairs include renewing of the starting winding and rebuild includes replacing both windings and all minor repairs. The prices for this type of motor are:

Minor repair	\$3.00
Major repair	\$5.06
Complete rebuild.....	\$6.53

All fractional horsepower jobs are tested on a dynamometer test bench with starting torque, r.p.m., watts, idle and full load, current and 100 per cent overload. The readings on repair motors must come up to the original factory characteristics.

Minor repairs carry a 90 day guar-

antee. Major repairs are guaranteed for one year. Dealers are provided with tags to speed and simplify routine. The tag attached to the motor constitutes an order. Work is started without waiting for additional authorization as soon as the motor is received at the shop.

Three men are regularly assigned to the fractional horsepower motor department. The small motor shop is organized so that it operates independently without recourse to the tools, equipment or stock of the main shop.

An elaborate filing system includes a data record, for all types of motors and apparatus, which is permanently filed for shop reference. Customer records include a tabulation of motor driven equipment and specifications for each of the customer's motors. This file is particularly valuable for service calls at distant points as complete shop data is immediately available. In calling for

[Continued on Page 125]

How INSULATION RESISTANCE

Special tests clear up factors affecting coils having asbestos, glass and mica insulation.

By Graham Lee Moses

Insulating Engineer
Westinghouse Electric & Manufacturing Co.

INSULATION resistance is one of the most extraordinary properties of matter. No other quality varies so widely between different materials nor so greatly under different conditions in the same material. So, since relative values may be so widely different, insulation resistance measurements have been widely misunderstood and mis-used.

The recognized factors affecting insulation resistance are material, treatment, temperature, test voltage, time test voltage is applied, moisture absorption, thickness of insulation and contact area. All of these factors are interdependent upon one another so that it is difficult to discuss each separately. Fabrics not only have lower specific resistivity than sheet or laminated material but vary more widely with temperature. Impregnation or varnish treatment actually lowers insulation resistivity, when the materials are compared while clean and dry.

When exposed to humidity, treated materials generally maintain higher insulation resistance values than the same materials untreated. The kind of treatment is a factor in insulation resistance, both dry and under high humidity. Temperature is an extremely important factor, though one not generally understood, so that its effect can be corrected to a common base for the purpose of comparison.

The resistance of insulation follows the same laws as all other resistance except as to temperature effect. For a uniform mass of insulation, the insulation resistance will vary directly as the thickness and inversely as the contact area and cross section of the path.

To observe the effect of the various factors in insulation resistance, a number of studies were recently made on motor fields and armatures. Curves were developed to show—

1. The effect of temperature and insulation resistance of a standard railway motor armature. Tests began at a cold resistance of less than 50 megohms, then the armature was vacuum dried three times, a set of data taken after each drying.

2. Data was taken on an industrial type motor which had been in constant use on a test floor since 1922. It was known to be clean and dry. So the different temperature effect on armature (mica ground insulation) and fields (treated-cloth ground insulation) was noted.

3. The effect of treatment and amount of mica wrapper ground insulation was next determined with long exposure to high humidity.

4. The effect of moisture absorption of a standard railway motor stator, when exposed to high humidity, and its recovery of insulation resistance, when returned to 40 per cent humidity, furnished further data.

From these tests and many others a simple formula was established for correcting insulation resistance for temperature effect and predicting values at another temperature. This formula is stated as:

$$R = r C^n \text{ — where } n = \text{Exponent } \frac{T - t}{10}$$

R = Insulation resistance at higher temperature to Centigrade

r = Insulation resistance at lower temperature to Centigrade

T = Higher temperature—Centigrade

t = Lower temperature—Centigrade

C = Constant

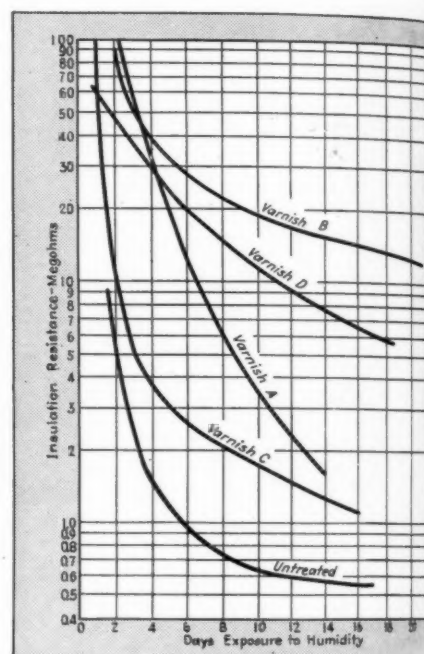
This depends somewhat on the particular combination of insulation on a specific machine. But as a general rule the following values are approximately correct—

Class A Insulation—.44

Class B Insulation — (with mica ground insulation) .63

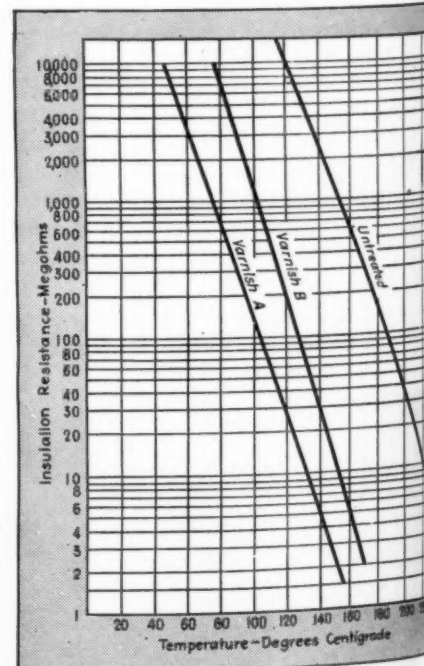
In order to segregate the factors affecting insulation resistance insofar as possible, and to evaluate each quantitatively, a special study was made with coils rather than complete machines. Three types of insulation—as

(Continued on page 126)

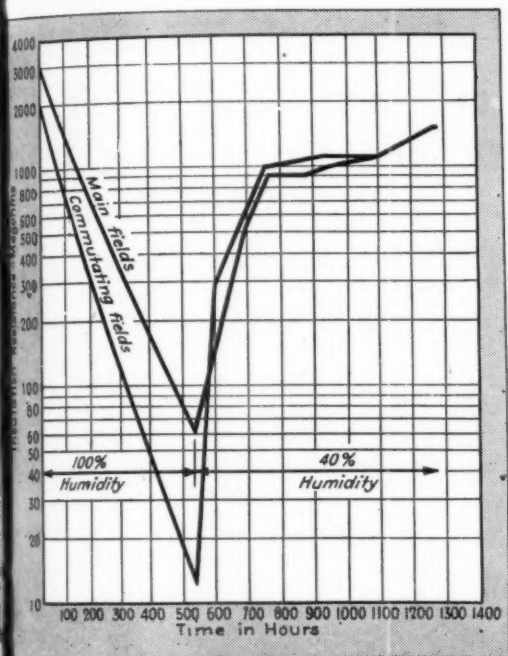


GLASS AND HUMIDITY—A comparison between test coils using glass tape, and exposed to 98 percent humidity.

TREATED ASBESTOS—Three test coils were subjected to temperature for comparing untreated and treated coils.

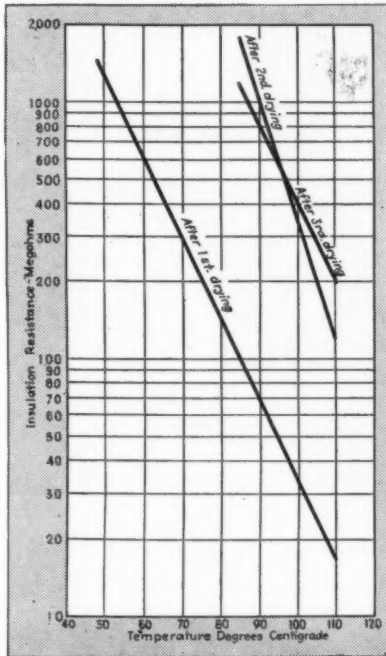
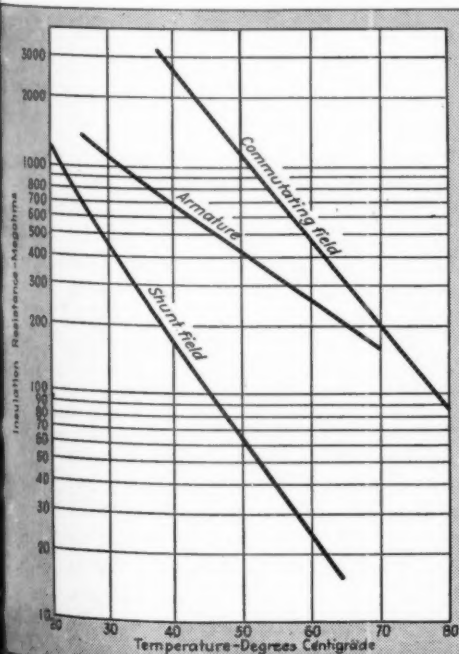


VARIES



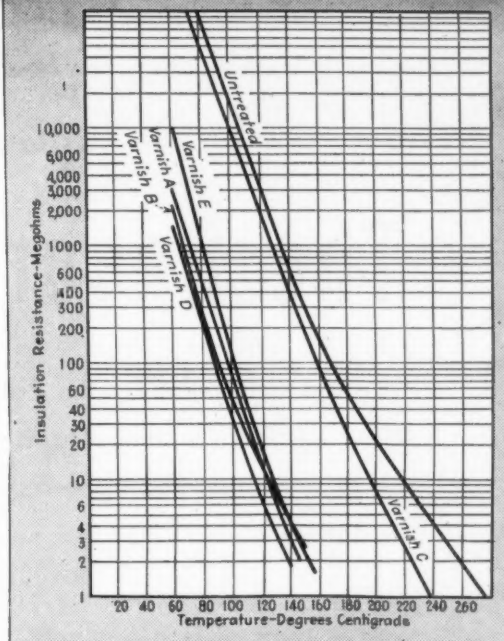
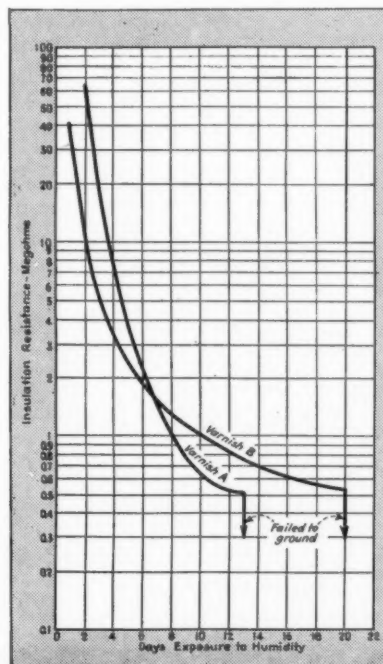
RECOVERY TEST—How mica wrapped coils behaved and recovered from humidity exposure.

ARMATURE AND FIELD—Increased temperature and declining insulation resistance for a 230 v. d.c. motor.

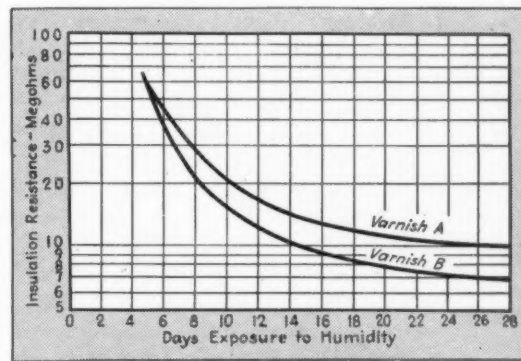


TRIPLE DRYING—How temperature affected a standard 60 hp. railway motor armature following three drying stages.

ASBESTOS SATURATION—Test coils employing treated asbestos were exposed to 98 percent relative humidity.

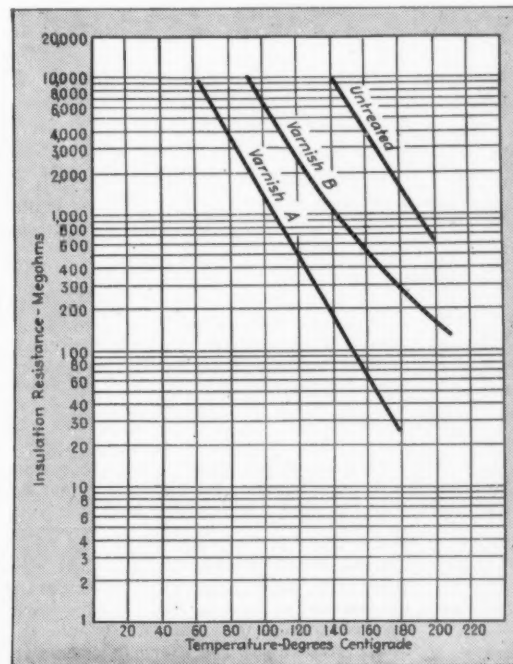


GLASS INSULATION—An untreated test coil was compared with five others employing different impregnations.



MICA EXPOSURE—Two grades of varnish used on mica-wrapped test coils and exposed to 98 percent humidity.

MICA TEST—This temperature test compares values of three mica-wrapped coils.



The Record of NISA

A frank statement by the President of the National Industrial Service Association which meets in Buffalo—May 19-21.

AS WE approach the Annual Convention of our NISA group, it is natural for members and other men to turn the appraising eye our way. And so I gladly raise the question—What good is NISA doing? I find I can answer it with a great deal of pride and assurance.

But before we start, let's have one basic consideration clear. The greatest good that comes out of any association is its effect on the minds of the men who belong to it. This is fundamental. Concrete services are important—because they bring practical benefits. But the principal reason men join such associations is that they may know each other better and share in each others knowledge and judgment. Therefore, the chief advantage of participation in such industry activities are psychological. And any man who lets himself forget that fact has already begun to lose the very essence of his opportunity in that association.

So when men ask me what the National Industrial Service Association does for its members, I say—"That's only half of it—the smaller half. The important thing is what they do for themselves." And yet we have a list of services that have developed over the past few years into what may be made a very worthwhile asset to a motor service shop. These include—

1. *A Central Winding Data Exchange.* Rewinding data cards are filled out by members on specific jobs and sent to our central bureau where they are on file available to all.
2. *A Rebuilt Equipment Exchange.* This gives each member a chance to list his stock-on-hand of rebuilt motors for a very nominal charge. Members buy much of this equipment from each other.
3. *A Certified Repairs Plan.* It sets up standards of technical ability, shop equipment and accounting practice—embracing proven shop layouts that insure efficient and economical production. A number of shops are already operating under this plan.



By C. A. Sievert

*President, Sievert Electric Company, Chicago
President, National Industrial Service Assn.*

4. *Technical Research.* A technical committee studies operations by machine, tool or hand and recommends new machines and methods for bettering shop practice.
5. *Survey of Motor Shops.* This is a study made for the United States Government to provide data for national defense planning. It classifies shop equipment and skilled men available. Data was requested from all shops whether NISA members or not. Returns were disappointing because they showed how many shops still operate as individual units without a sense of their industry or national significance and responsibilities. Our statistics were sufficient to work out a useful report, however.
6. *An Authorized Service Plan.* A program now under development in cooperation with manufacturers of equipment. The purpose is to set up an authorized service under which NISA members can be certified for a definite high standard of service to specified equipment.
7. *Scrutiny of Legislation.* A competent committee studies state and national legislation affecting motor shop activities and reports to the membership. It also advises members on problems of taxation and insurance.
8. *Cost Data Analysis.* Another committee has established a regular analysis of cost factors in the motor shop business. This includes primary cost data on every type of electrical equipment and every item of overhead expense, in its relation to the general business. A unified cost and book-keeping system is being developed.

I could continue this listing still

further but I will not. This in itself is a substantial program. And how far have these services gone? Some farther than others, all in accordance with the responsiveness of the membership. But together they constitute a valuable resource of information, counsel and experience now available. It is a good record for the few years that NISA has been at work.

This work I take to be highly important to all motor shops. Nay it is vital, if we are to play the part we must in serving American industry in the present National Defense Emergency. For in this service we cannot act as isolated independent individuals. We must marshal and organize our resources to give them the very maximum strength and capacity in this hour of urgent need.

Contacts Important

And beyond all this, comes what I have called the most important value of all—the advantages that grow out of the men you meet and grow to know and trust, the broader experience they bring you, the new confidence which the knowledge they share with you contributes to your own judgment. And this, of course, is the reward for your activities in local chapter meetings, and your attendance at our conventions. Chapters are already operating in Chicago, Cincinnati, New Orleans, Wisconsin and Texas. More are coming.

Our convention this month in Buffalo will be rich in ideas. The program will be full of them. The men present will talk motor shop experience in meetings, corridors and hotel rooms and all a member hears and learns is his to keep. It is a great privilege to be there—a valuable opportunity. For out of these contacts many of us have discovered faults in our own methods and policies, some so serious that they were actually sopping our profits away unseen.

And for my part, may I add, that I have never met such fine men as we have in this NISA of ours. It has brought together the enemies of yesterday and made them friends. It has taught us that each one of us is just trying to make an honest living. It has showed us that we can make a better, happier living by peaceful cooperation than by strife.



GENERAL LIGHTING of 25 foot-candle intensity in the large office areas is provided by rows of closely suspended four-lamp semi-indirect fluorescent units.

ALL FLUORESCENT Office Lighting

This New Jersey oil company provides uniform high intensity lighting throughout its new office building by using fluorescent units in all departments.

THEY realized that good lighting is an important factor contributing to increased employee efficiency. So the Standard Oil Company of New Jersey insisted on high intensity illumination in its new office building at Elizabeth, N. J.

The building is of a two story and basement type, approximately 173-ft. by 128-ft., with a 70-ft. by 26-ft. open court in the center. Artificial illumina-

tion is provided by fluorescent units throughout, from basement to top floor.

General lighting of 25 foot-candle intensity is provided in the general office and private office areas by 239 four-lamp and 26 two-lamp fluorescent units using 40-watt white lamps. These units are of the commercial semi-indirect type, equipped with a two-panel V-shaped diffusing glass enclosure. They are spaced on 10-ft. 6-in. by 11-ft.

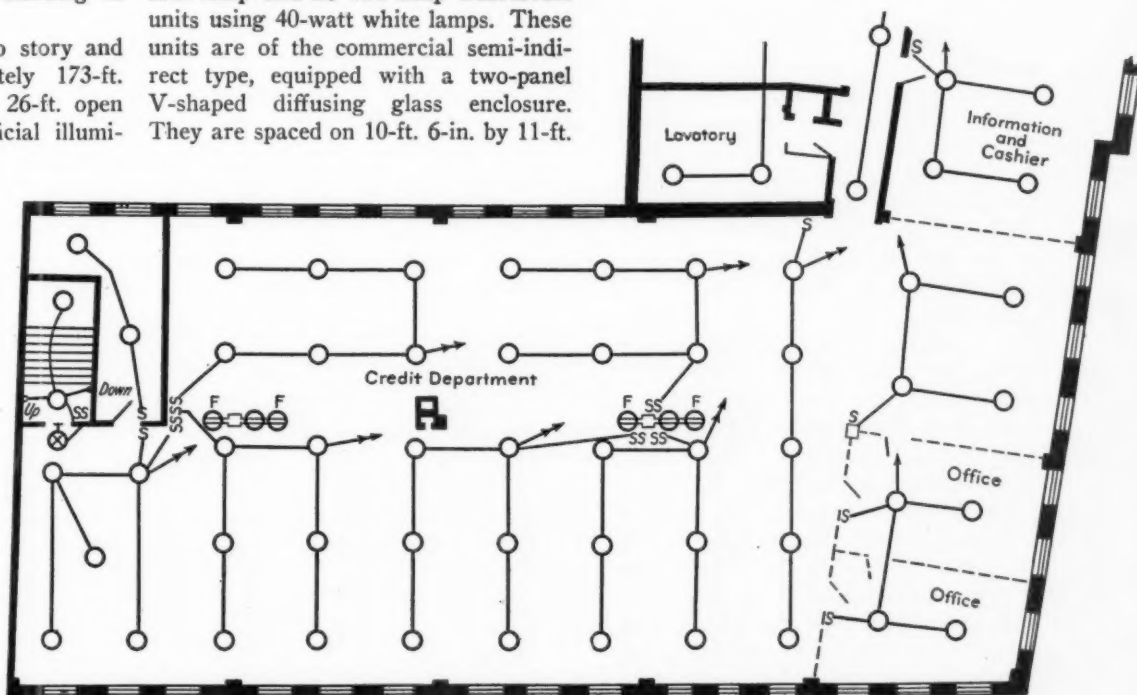
centers and mounted on 6-inch double stems on an 11-ft. ceiling. Where the units are in private offices the spacing varies slightly to conform to office size.

The basement area is illuminated by 67 two-lamp industrial fluorescent units using the 40-watt white lamps. The one exception to this general basement lighting is the recreation room. Here, 10 rows of concealed fluorescent open troughing, mounted flush in an 8-ft. 6-in. hung ceiling, provides 38 foot-candles of evenly distributed light. Each section of trough, which is mounted on 8-ft. centers, contains two 40-watt white lamps end to end.

The lighting distribution system is of the three-phase, four-wire, 120/208 volt type, with one 52 circuit distribution panel serving each floor. Circuit breaker branches feed each group of three units, with a maximum of 600 watts per circuit. Individual switches provide local control of each group of three units. Each row of fixtures is connected to alternate phases of the distribution system to minimize stroboscopic effect.

The fixtures installed are decorative as well as practical and the resulting lighting is most satisfactory, according to the building management. E. J. White Company of Newark, N. J., was the electrical contractor on the job.

CIRCUIT DIAGRAM showing fixture locations and circuit and switch control for a portion of the general office area. All circuits go to a single distribution panel for the entire floor.





LARGE CAPACITY units are the secret of effective installations. H. G. Street of the Memphis Electric Co. in Memphis, Tenn. says, "average sale runs \$150".

NEW HOMES, large and small offer prospect for comfort cooling. Big market is in old homes. Installation is easy. Profits are good.



Attic Cooling

at LOW COST

ATTIC fans, large air circulators for house cooling, are sometimes called the "poor man's air-conditioning". A compromise with full conditioning, attic ventilation equipment fits the average pocketbook and provides summer comfort in the ordinary un-insulated home at a low price.

First class equipment costs the home owners from \$125 to \$175 installed. Power consumption is moderate, about \$10 a year. And the summer comfort provided by a well-installed and adequately sized unit is large for this amount.

Right now electrical contractors and dealers are laying plans for the biggest year of attic fan sales in history, because a few years of sales experience in the South and Middlewest show figures that double each year. Market saturation is still insignificant. Almost every owned home of any size is a potential installation. And it is usually a one price job.

The principal distinction between house cooling fans and ordinary ventilators is in the volume of air handled. The New Orleans Public Service Company recommends for "comfort cooling" a fan of sufficient capacity to move a quantity of air equal to or greater than the entire volume of the house every minute. Exhausted from the attic, this quantity of air will produce a perceptible breeze through windows left open in living room or bedrooms.

Attic fan dealers are setting sights high for the 1941 season. For attic fan summer comfort fits the average pocketbook. Yet it takes skilled installation. Here is a natural for sales minded electrical contractors.

By W. T. Stuart

The average attic fan installation consists of a large slow speed fan direct connected or belted to an electric motor. The fan is from 24 to 60 inches in diameter, usually mounted behind louvers in the attic. It draws air up through the house and exhausts out-of-doors.

A preferred type of installation uses a fan suction box in the floor of the attic. The fan exhausts into the attic space, drawing air from the floor below through a ceiling grill. An automatic door is provided on the grill, which blocks the air circulation and cuts off the fan automatically in case of fire.

Open louvers in the attic wall or screened openings under the eaves provide an outlet for the attic air. Often where space is limited two or more fans can be installed. One out of every

five attic ventilation systems installed in New Orleans in the last three years have been two fan jobs.

The ceiling opening below the fan is an important factor in the operation of the system. It must be big enough to permit a free flow of air to the fans. If the ceiling and attic openings are too small, the fan will move much less air and the fan motor, laboring under a restricted air flow, will use more power. So the grill should not offer too much resistance to the flow of air. About 25 per cent restriction of the minimum opening is considered acceptable. The grill may be of wood or metal.

Fan motors may be $\frac{1}{2}$ to $\frac{1}{4}$ hp. They are usually wired with a separate circuit of No. 12 wire, switched on each floor, sometimes with a pilot indicator.

Electrical contractors who specialize

in the field, like David Craton of New Orleans or H. G. Street of Memphis, rate attic fan installations tops as a business builder for slack mid-summer months. In the South where summer temperatures come early and high, customers start signing on the dotted line in May, they say. The bulk of the year's volume is sold between the first of May and the last of August. Business carries on, however, well into September. This has proved a good time to sign up time-pay prospects for spring installation.

Besides the permanently installed equipment in owned homes, air circulators for rented homes and apartments have been a profitable filler. The portable units are plug-in jobs of large size for installation in a window. And from the merchandising point of view, they may eventually out-strip the permanent installations in sales volume.

In New Orleans, comfort cooling promotion was started as far back as 1932 by the utility. It was featured in newspaper advertising, direct mail pieces and installation in an electrical home. But the important figures start from a couple of years later. In the 1934 summer, 54 installations were made in the city and 72 during the summer of 1935. After the first few sales, the utility company discontinued selling the equipment and confined its efforts to promoting and developing business for the dealers. All leads developed by the utility sales representatives were turned over to them. During the year 1936 some 187 installations were made and 227 in 1937.

In 1938, an elaborate coordinated dealer-utility program was organized and 599 installations were made during that year. Further coordinated programs were run during the following year, 1939, running up a total of 1,578 of these cooling systems.

The last year's figures for 1939,

SCHEDULE OF ATTIC FAN SIZES WITH REQUIREMENTS FOR CEILING GRILLE AND ATTIC OPENINGS

SIZE OF HOUSE IN CU. FT.	APPROXIMATE FAN WHEEL DIAMETERS	MOTOR SIZE H. P.	CEILING GRILLE Total Sq. Ft. Opening in Ceiling Lattice Wood or Metal	ATTIC OPENINGS Total Sq. Ft. Opening in Attic		
				Hardware Cloth	Louvers	Screen
5,000 to 6,000	24" to 30"	1/8-1/4	12	10	14	17
7,000 to 8,000	30" to 36"	1/4-1/2	15	13	19	23
9,000 to 11,000	36" to 42"	1/4-1/2	21	18	26	31
12,000 to 14,000	42" to 45"	1/2-1/2	27	22	33	40
15,000 to 17,000	45" to 50"	1/2-3/4	32	27	41	49
18,000 to 20,000	50" to 56"	1/2-3/4	38	32	48	57
21,000 to 23,000	56" to 60"	3/4-1	44	37	55	66

FAN SIZES are figured by cubic contents of the house. Ceiling grills and openings must be big enough to permit free air flow.

began to show the development of the window box type of installation. Out of these 1,578 units, 921 were of the attic ventilating type and 657 of the window box type.

In the unusually cool summer of 1940, the total attic and window fan sales were 1,940. With 17 cooperative dealers, the total figures for 1941 will probably exceed 4,000 in a potential market of approximately 30,000 owned homes and 70,000 renter prospects in New Orleans.

This is the record of progress in one city. Statistics drawn for the whole country tabulated by *Electrical Merchandising* show that attic fan sales increased from 8,522 units in 1937 to a conservatively estimated 20,000 in 1940. Including wiring and installation, this latter figure represents a retail volume of nearly \$3,000,000.

Other unofficial estimates for 1940 show sales in Houston in excess of 3,000, in Memphis over 1,500. While these may appear disproportionate in view of the national total, sale of attic fans has been distinctly spotty with cities of the South and Southwest doing the biggest job.

In Memphis, electrical contractor

H. G. Street of the Memphis Electric Co. reports sales volume, averaging 50 fans in 1938 and 1939, dropped off in 1940 due to severe competition from tin shops, ventilating contractors and hardware stores. However, a competitive line will be carried this year to meet these conditions. Street predicts that 1941 sales will easily exceed 1939 business volume. Installations average \$150 installed, with big units very popular.

To this must be added the extra work that the customer orders while the fan is going in. Extra outlets, new circuits, wiring devices, circuit breakers and fixtures are some of the plus business.

In New Orleans, electrical contractor David L. Craton, reports a gross volume of \$4,500 in attic fan work during 1940. He estimates a \$10,000 volume this year.

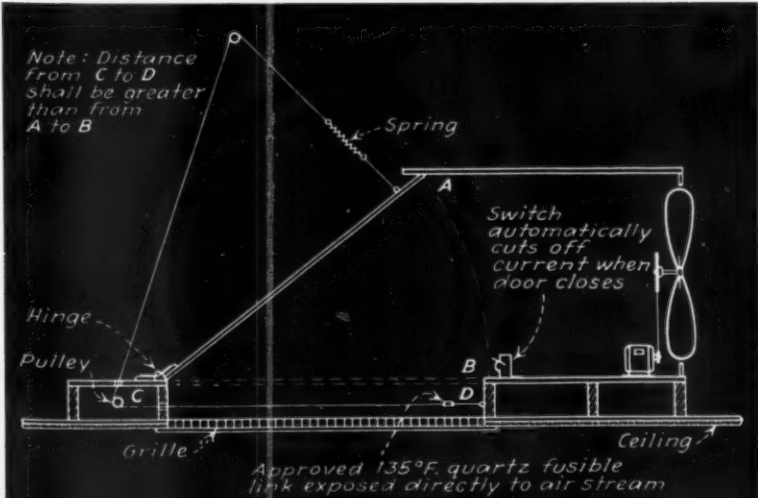
A 48-in. fan installation sells for about \$150. It can be installed at a cost of \$80 to \$85 with an additional \$20 for wiring. This leaves a 33 1/3 per cent margin for overhead and profit.

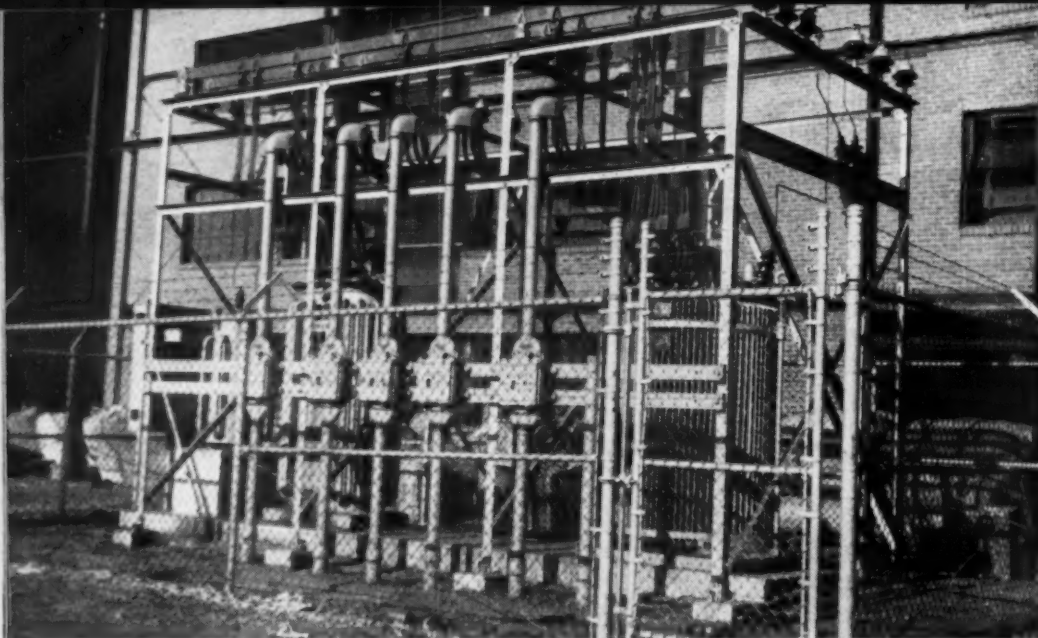
In this work, Craton tries to sell 25 to 30 per cent extra air capacity over the minimum for the job. This invariably gives you a customer who is more than just satisfied. "They come to see you afterwards, just to thank you for selling them the additional capacity for extreme weather," he says.

Window fans are largely a merchandising job, but they do bring in extra outlet work. A 30-in. window fan with a capacity of approximately 6,000 cu. ft. of air per min. costs around \$30 and retails for about \$49. And a dealer well established in the attic ventilation business has an inside track on this.

Utility companies are finding attic fans a splendid load builder. Contractors are finding them a profitable specialty. Also this year more people have money to spend. So attic fans offer contractors a sales opportunity that may easily emulate the automatic heating business.

FIRE RULES require a method of cutting off fan and air stream. Here a fusible link drops a door and trips the fan switch when the air stream reaches 135 deg.





OUTDOOR DISTRIBUTION begins at the secondary of this 11.4 kv. substation. Underground feeders are protected by weatherproof fused disconnects. Lighting transformer and panel are at extreme left.

A VERTICAL DISTRIBUTION

This distribution system is designed to provide unit control to duplicate tandem type production lines in a cork plant. It eliminates the conventional main switchboard and has possibilities in other industries.

By J. M. Alexander

Hatzel & Buehler, Inc., Wilmington, Delaware

A CUSTOM-BUILT power distribution system was recently installed in the new six story addition to the plant of the Corktex Products Co. This is a subsidiary of the Bond Manufacturing Co. of Wilmington, Delaware.

The building houses crushing and mixing mills, which comprise a straight-line vertical process. Raw cork enters hoppers on the top floor and emerges as finely ground, clean particles on the ground floor. The ground cork is then mixed with a binder to form cylindrical, tubular and sheet cork.

Three identical production units are located side by side and arranged so that one unit may be shut down while the others carry on production. Naturally, the electrical system had to be designed to provide this flexibility in production control. This idea was carried out right to the transformer mat, to prevent all possibility of a feeder outage disrupting all production.

Originally, horizontal distribution

was considered—that is, the type where one panel on each floor serves all motors on that particular floor. However, Hatzel & Buehler, electrical contractors on the job, discarded this conventional method and designed a vertical distribution system to provide the owners with the production flexibility and control desired.

The system begins at the 11.4 kv. outdoor substation adjacent to the building. Here, two 333 kva., 11.4 kv/220 volt single-phase transformers, con-

nected open delta, supply 220-volt, three-phase service. A third transformer can be added for future demands. Five power circuits, each consisting of three 500,000 CM cables protected by a weatherproof Colt-Noark fused disconnect at the transformers, go underground direct to five distribution panels in the building. The conventional main distribution panel or switchboard with the necessary mounting space is thus eliminated.

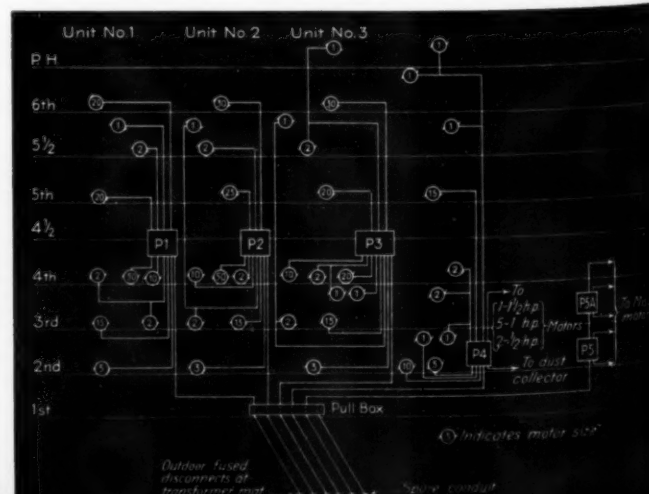
Three of these panels, serving the three production units, are located on the fourth floor nearest the largest motors. The other two panels are on the second floor and serve miscellaneous motors not directly connected with the production units; also spare circuits.

Branch circuits emanate from each panel and go to all floors, feeding motors serving that particular unit. The control circuits of all motors of a single unit are electrically interlocked, so mechanical or electrical trouble on any one motor will stop the rest and thus prevent material jams and spoilage and equipment damage. Once stopped, these motors can be started again only by manual operation at the motor site.

The lighting system is supplied with current through one 50 kva., single-phase, 11.4 kv/110/220 volt transformer at the outdoor substation. Circuit breakers, mounted in a weatherproof cabinet adjacent to this transformer, protect the underground feeders which enter the building.

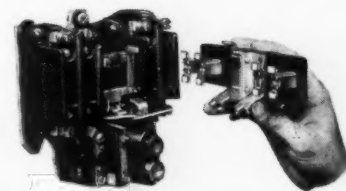
Although designed specifically for this particular production process, this method of power distribution may have possible applications to other industries employing the vertical straight-line production system. The contractor and plant man should study it for its merits. It may prove to be a good selling point, for an engineered job is always the better job.

ONE LINE DIAGRAM showing the vertical distribution from transformers to individual motors. Manual and interlocked control circuits are eliminated to simplify diagram.



*"Just Look at that
DUST!"*

IT'S amazing how much dust settles on any horizontal surface—even where cleaning is done on a regular routine. If you get dust like that in a home, think of the amount of dust that collects on horizontal surfaces in a factory. That can be a problem in Motor Control—for dusty, dirty contacts always mean trouble. So save yourself trouble by specifying Cutler-Hammer Motor Control, the Motor Control with VERTICAL contacts that can't collect dust, that stay clean, work better, last longer. Accept no substitutes. CUTLER-HAMMER, Inc., Pioneer Electrical Manufacturers, 1306 St. Paul Ave., Milwaukee, Wis.



The mark of better Motor Control is found in Cutler-Hammer VERTICAL, Dust-safe Contacts...the only Control using them exclusively.

Dust Safe VERTICAL Contacts

Inner Strength

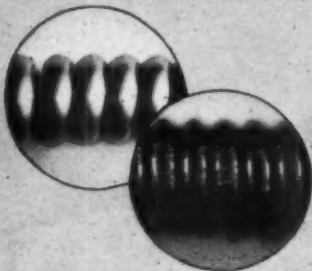
The New **TRI CLAD** Motor



*** New FORMEX WIRE maintains
ITS DIELECTRIC FILM UNDER SEVERE CONDITIONS**

ABRASION

Formex wire is insulated with a vinylacetal-type plastic developed by G-E engineers after 10 years of research. Tests of resistance to abrasion show a 3-to-1 superiority of Formex wire over high-grade enameled wire. Formex wire in *your* motors gives added assurance of dependable, continuous operation.



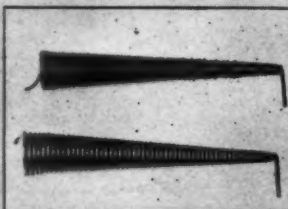
ELONGATION

Compare the two pictures above. The top photo shows Formex wire stretched 20 per cent and wound on its own diameter. The lower picture shows enameled wire stretched 10 per cent and wound on twice its diameter.



HEAT SHOCK

The top sample (below) shows what happens to good enameled wire when it is wound in a helix and heated to 150 C. Formex wire (shown at bottom) is unaffected by this heat shock. That is why it does not become brittle and crack away even after years of strenuous service.



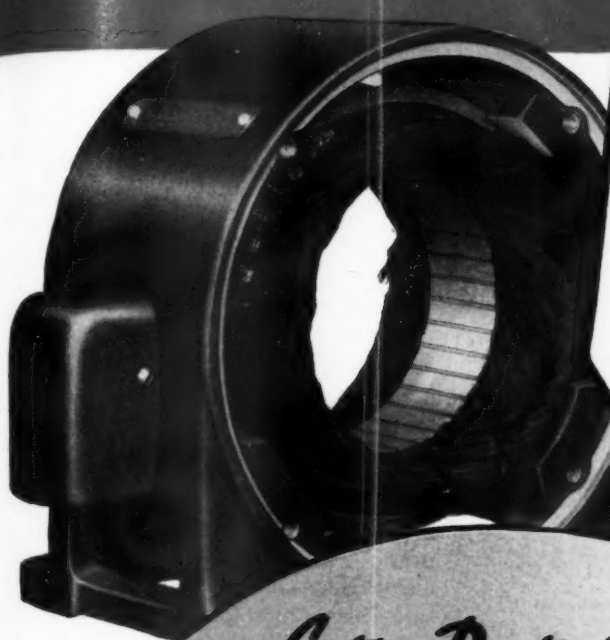
Extra Protection

against physical damage

Strong, one-piece, cast-iron frame and end shields, with upper portion completely enclosed, protect vital motor parts from external blows, flying chips, settling dust, dripping liquids.

*...built for
protection first
...to last!*

h Begins WITH FORMEX*



NO "MUMMY INSULATION" HERE

With Formex wire, G-E engineers were able to "take off the wraps" on random-wound motors. Away went organic "mummy" coverings and heat-enclosing compounds. Having Formex wire, G-E engineers built a stronger, tougher motor insulation.

Extra Protection

against electrical breakdown

When you're looking for a longer-lasting motor—one that won't wilt and weaken after years of strenuous service, or fail you in an emergency—you want the Tri-Clad motor with its *inner strength*.

When G-E engineers designed the Tri-Clad motor, they saw that the toughness of Formex wire insulation opened up new opportunities for strengthening the entire coil assembly from the inside out. They utilized new G-E synthetic-resin bonding varnishes to give rigidity and extra resistance. They fortified the slot-cells. They welded internal connections.

Finally, they selected for application on end turns a coating of Glyptal No. 1201 Red as an additional armor against the many adverse operating conditions commonly found in industrial service.

Thus, in the Tri-Clad motor you get a more compact winding—one that dissipates heat quickly and keeps the motor young.

With double-end, "controlled-velocity" ventilation and advanced electrical design throughout, the Tri-Clad motor's tougher coil windings mean extra years of service. Next time you order induction motors . . . make sure they are Tri-Clad motors. General Electric, Schenectady, N. Y.

Integral-hp sizes up to 20 hp (at 3600 rpm), open or splashproof, are now available—also capacitor-motors in sizes up to 5 hp.

Write for our new Tri-Clad motor bulletin, GEA-3580

Extra Protection

against operating wear and tear

Sleeve bearings of new design have longer life, greater capacity, improved lubrication features. One-piece cast-aluminum rotor winding, with fans cast integrally, is practically indestructible. Sealed ball bearings retain lubrication, exclude dirt.

GENERAL  ELECTRIC

750-50-8058

Editorials

Earl Whitehorne, Editor

That Census of Factory Needs

Last month, our opening editorial page said electrical men are not doing all they should toward winning this war. It suggested that a census of production possibilities be made in each city to uncover places where more electrical equipment would increase capacity, speed production, improve working conditions and cut costs. It urged that electrical men get going on such a check-up, particularly contractors and power company men, working maybe in groups of three, each group calling on so many factories. They would report their findings to the management and to the Government.

Many letters have come in discussing this recommendation. They vary widely in opinion.

1. Some felt that electrical men are doing all they can. And indeed many are hard at it in Washington and at home.
2. Some felt we were too critical in saying that too many electrical men are thinking only of taking care of their own business, a heavy burden in itself in these times and plenty to do if power is provided for all industry and factories are running full tilt and all orders are filled.
3. Some said that a similar check-up had already been made in their town.
4. Some said it had not been done, but they would get busy at once and get it done.

Great interest in the subject was evidenced by many two and three page letters. It was conceded that electrical contractors and power company men can best do the job, with help from other experts available. And most agreed that such a check-up would uncover enough new business and load to pay well for the time and effort.

If this editorial results in the launching of but a single local check-up of things that can be done to increase

production in American factories, we are well paid. And we are convinced that electrical men can make a fine patriotic contribution in this way. It is not enough for contractors to merely respond to all calls for wiring. We must help win this war—each one of us—in any way we can.

These Strikes

Contractors and wiremen of the electrical construction industry should both be grateful and proud that theirs has been practically a strikeless industry. For twenty years or more, employers and employees in this field have worked in comparative peace, thanks to the good influence of the Council for Industrial Relations in providing a plan for arbitration.

The recent flare up at Wright Field, was a pointed reminder of the value of self-control. Here A.F.L. electricians quit because some C.I.O. wiremen came on the job. It was a shock to electrical contractors to read about it.

It was a shock to all good citizens. We readily agree that wiremen have a right to organize for their own welfare. But when they scout the public welfare, nay even defy our common government in its effort to prepare for National Defense, because a few other union workers carry what the majority consider the wrong card, it calls for public indignation and the scorn of all union men who are good Americans.

Surely union officials who cannot work out their inter-union affairs with moderation and restraint, lack the wisdom, responsibility and patriotism that would entitle them to be entrusted with leadership. The average wireman is as good an American,

with as much common sense as the average contractor for whom he works. He should guard his right to self-government and sound policy in his union.

Shop Responsibility

The Army and Navy Munition Board has issued a list of selected occupations, important to national defense. Men at this work are to be disturbed as little as possible by the draft. Among these are electrical repairmen, motor repair men, armature winders. This is as it should be.

When NISA meets this month in Buffalo, the responsibilities of the motor shop in our National Defense Program will be the chief theme in meeting rooms and corridors. And it all gets down to the practical problem of service to industry. How to take the burden of emergency off the overloaded shoulders of the factory maintenance staff is the important issue. Shops must plan and cooperate to broaden and strengthen their support to the electrical machinery that is turning out munitions to win the war.

Wholesale or Retail

At the recent Minnesota meeting at Albert Lea the electrical wholesaler was under attack. Every time a contractor gets a fluorescent job, 'twas said, there are six jobbers trying to under-sell him.

It looks as though the "Wholesale Only" idea is slowly dying in some areas, and manufacturers are going to have to make a decision. Are their distributors to operate at wholesale or retail or both?

But it is not an ethical question. It is a very practical problem. And if the electrical manufacturer refuses to face the test, distribution in the industry will go down into worse chaos until self-preservation compels reform. And everybody will suffer.

Fire Clean-up

When fire damages basement feeders, the clean-up job often involves removing burned wire and conduit together. Usually it is a tough hacksaw job. But a Chicago contractor recently decided to tackle one such mess with a cutting torch—with ex-

cellent results. The fire damaged wiring was stripped out in a fraction of the time usually required.

Flame or arc cutting and welding are techniques that take some specialized skill. But in the hands of good mechanics they are valuable tools for electrical construction. They deserve wider use in the industry.

Substitute Materials

National defense production is showing up annoying shortages of some materials. Many, perhaps most, of these spot shortages will be smoothed out as the gears of defense production begin to mesh.

Meanwhile it is up to electrical contractors and plant engineers to keep in close touch with new developments and to be ready with alternative approved methods and materials. There is already a dangerous tendency to fill the gaps with temporary wiring which under today's pressure is likely to become permanent.

Program Topics

Why do contractors state conventions keep repeating the old mistake of filling their programs with papers on national problems. Members are local business men. They need help on local problems, policies, experience.

The trouble is that when you elect a man to office, he thinks he must broaden his interest. He soon bogs down in big problems that nobody present can do anything about.

So too many associations flounder around and render less service to the membership than they easily can if the men in charge stick to home town topics. Estimating, cost of doing business, how to get on with labor, how to sell larger jobs—these are the vital factors for the program committee to work on.

Your Help Needed Here

Wire and cable manufacturers are faced with an acute shortage of shipping reels, spools and cases. It is already slowing up deliveries of shipment to Defense Projects. It is wasting time, materials and labor on

making new reels and cases, just because customers are neglecting to return these containers as they normally would.

This is all understandable. Everybody is extra busy and reels are being stacked in the yard. You just don't bother with them. But multiply this neglect by 10,000 other cases and see what you get.

Give orders today! Ship all returnable empty reels, spools and cases to the manufacturer at once. Your help is needed here.

Back Talk

Catalogs Are Tough

To the Editor—"Bids on electrical wiring jobs vary mostly from lack of knowledge of costs. This lack comes about mostly through the difficulty of maintaining simple and easily handled cost records. The manufacturers' bulletins and price sheets are a maze of confusing description and figures and are useless to the contractor trying to price his job sheet. I wonder if we can make a plea to have the manufacturers simplify their bulletins—place a good sized legible page number in the upper right hand corner, the index in front of the booklet, larger, more legible type; light colored paper; have all matter start at the left hand margin so the eye won't get so tired eliminating all the useless matter now used; with proper illustrations and a date on the cover. I wonder if anyone has ever noticed the time wasted trying to pick out the rating and price in the average device in the present catalogs? Let's have some more discussion on this."

E. M. Raetz
Rochester Electric Co.
Rochester, Minnesota

Your comments are well taken, Mr. Raetz. But it is a tough problem. Manufacturers want their literature distinctive. Of course, we believe in standardized data and so we publish annually the "Electrical Buyers Reference." This comes nearest to a dated, uniform, comparable catalog now available. You suggest a standard page arrangement on which the contractor could write in his costs. But we fear there is no escape from the burden of keeping your own cost records.

Sound Endorsement

To the Editor—"We agree with you that the electrical contractor is not the one responsible for the present situation in the field of fluorescent lighting. Our own experience has been and is that the electrical contractor is helpful in selling installations properly engineered and properly installed. Certainly the electrical contractor is not to blame for the plug-in devices which are being peddled from door to door by high pressure salesmen.

"Local electric leagues and electric associations, the Illuminating Engineering Society and other similar organizations should be urged to carry on an educational campaign along the theme outlined in your editorial."

R. W. Staud
Benjamin Electric Mfg. Co.
Des Plaines, Ill.

Thanks, Mr. Staud. We believe that this kind of united action will gradually develop and put an end to the present growing pains in this new lighting business.

It Comes So Fast

To the Editor—"I like your article, 'We Will Not Take the Blame', very much indeed. It's very much to the point. There are over 150 manufacturers of fluorescent equipment who are doing more than just a local job. This means that most of them are small manufacturers relatively. They are out to sell as much as they can, as quickly as they can—which is perfectly natural.

"The solution of the problem of selling better light is a local one, it seems to me, where local cooperative activity, headed up by the utility, solves these problems for the benefit of all. Certainly, the contractor is not to blame. Neither, to my way of thinking, is any one factor, in the sales and distribution channel. It's just that fluorescent lighting has come so fast and business has been so easy to get that the industry has not caught up cooperatively as they have in most other products."

H. Freeman Barnes
General Electric Co.
Nela Park, Cleveland, Ohio

It is indeed a local job and as such needs power company leadership and support. And the contractors should be working close with the power men to sell the Better Light idea to the local merchants, who are too apt to buy something new for its novelty value alone.

A Good Start

To the Editor—"The new era of illumination is being seriously impeded by both contractors and salesmen. Too much emphasis is put upon the possibility of saving current cost and buying the cheapest fluorescent unit on the market. This results in mediocre or bad illumination.

"Unless the salesman, contractor and buyer recognize the opportunity of securing a high level of light, the new lighting will cause many disappointments.

We have tried to start in the right direction by joining the Fleur-O-Lier Manufacturers. This organization believes in high standards of construction, efficiency and general application of lighting fixtures. The buying public should favor the Fleur-O-Lier program.

R. R. Wiley
R. & W. Wiley, Inc.
Buffalo, New York

The Fleur-O-Lier group is to be congratulated on its cooperative program. It is helping to bring stability and order into this market.

Promote Harmony

To the Editor—"We read *Electrical Contracting* with interest and feel that it helps keep us abreast of contractors' problems. It would seem that we can do a better job of service, if the two groups have a mutual feeling of trust and understanding.

"But you have a continued attitude of stirring up a feeling of distrust among the contractors. It seems an issue of your magazine is not complete until you have somewhere taken a crack at the utility industry. Editorials of the type 'Another Dodo' in February is a mild example.

"I am sure that if you tried you could find examples of utilities trying to work with the contractors in their cities. Why not give a little publicity to this sort of thing to balance the impression of distrust that you carry month after month?"

Frank Sanford
The Cincinnati Gas & Electric Co.
Cincinnati, Ohio

We are not trying to stir up bad feeling, Mr. Sanford. But we do point out conditions that are wrong and urge the contractor to do something about them. If this involves criticism of the power company, manufacturer, wholesaler or the contractor himself—what of it? We discuss the situation just the same.

We know that many power companies work closely with the contractors. That is quite natural—and vice-versa. But that does not alter the fact that small diameter wire is languishing for lack of power company action.

WIRING

Methods

FISH TAPE HOLDER

A simple holder for steel fish tapes was constructed from a short piece of $\frac{3}{4}$ -in. electrical metallic tubing, curved to conform with the size of coil desired. The tape is coiled through this piece of tubing which, in addition to keeping the tape in an orderly coil, serves as



NO KINKS or troublesome unwinding and twisting of this fish tape which is securely wound in a convenient holder made of thinwall metallic tubing.

a convenient handle to carry and hold the tape while in use. The tape may be coiled and uncoiled with ease. Unwinding and kinking of the tape is entirely eliminated.

SWITCHBOARD RISER TROUGHS

The use of riser troughs for load-side connections to branch circuit conductors on the back of a switchboard, is a typical example of the engineering done by the J. F. Buchanan Electric Co., electrical contractors of Philadelphia, Pa.

The troughs illustrated here were used on the back of a remodeled switchboard in a large Philadelphia office building. They extend from the top of



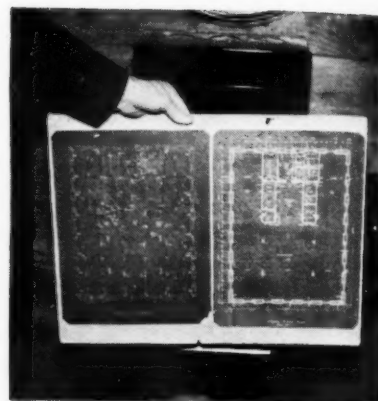
VERTICAL TROUGHS of ebony-asbestos conceal the branch circuit conductor connections to the back of the circuit breakers on this switchboard. Arrows show bus extensions to the breakers.

the board to the wiring trench running along the entire length of the bottom of the board. These troughs are 9 inches deep and 6 inches wide and are made of $\frac{1}{2}$ -inch ebony-asbestos, on three sides. The fourth side is the 6-inch channel iron switchboard upright. The ebony-asbestos sides are built as removable sections.

The branch circuit conductors in the riser troughs are connected by solderless connectors to the copper bus extensions to the load side of the circuit-breakers on the board. Thus, the back of the board is kept exceptionally clear with only the interconnecting bus to the line side of the breakers and the short load side bus extensions exposed.

JOB PLAN PROTECTION

Even with extraordinary care, blue prints take a severe beating on the job. And torn, obscure or faded prints may cause expensive omissions. The Hill-Sieders Electric Company of Houston, Tex. has a routine method of preparing job prints so they can take it.



PERMANENT JOB plans survive weather and rough handling protected by wall board and shellac.

Prints of the construction plan and the electrical layout are pasted on a sheet of wall board and then heavily shellacked. Corners which might curl up are trimmed. Large prints are prepared with a light wooden frame around the board.

Where changes occur, the revised layout is cut out and pasted over the original.

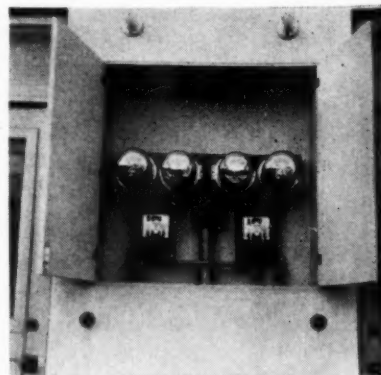
The plan shown in the accompanying photo is in perfect condition, the colored pencil notes still clear after many man-hours of rough job use in all kinds of weather.

After the job is finished, the plans are returned to the shop for a permanent job record.

STANDARD HOUSE UNITS

Standardization of service entrance equipment made possible speed of installation and economy for the 1,102 units in the Wyvernwood rental development in Los Angeles, the largest community of rental homes in a single park in the country. Newberry Electric Corp., electrical contractors, designed a standard equipment for each home unit.

These units are installed in pairs at



DOUBLE UNIT for service to two family dwellings designed by Los Angeles contractor.

DEFENSE NEEDS DELIVERIES



RETURN Empty Reels .. AT ONCE!

In the interest of National Defense we urge your cooperation with all wire and cable manufacturers.

GENERAL CABLE CORPORATION

RUBBER COVERED POWER CABLES • BUILDING WIRE

CRESFLEX NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • MAGNET WIRE • BARE WIRE

CRESCENT CABLES *SUPPLY* POWER for DEFENSE

Among these are
POWER CABLES
CONTROL CABLES
SIGNAL CABLES
PORTABLE CABLES
BUILDING WIRES



CRESCENT INSULATED WIRE & CABLE CO.

Ask Your Wholesaler for



CRESCENT WIRE and CABLE

Factory: TRENTON, N. J.—Stocks in Principal Cities

CRESCENT ENDURITE SUPER • AGING INSULATION

ARMORED CABLE • FLEXIBLE CORDS • LEAD ENCASED AND PARKWAY CABLES • VARNISHED CAMBRIC



[FROM PAGE 36]

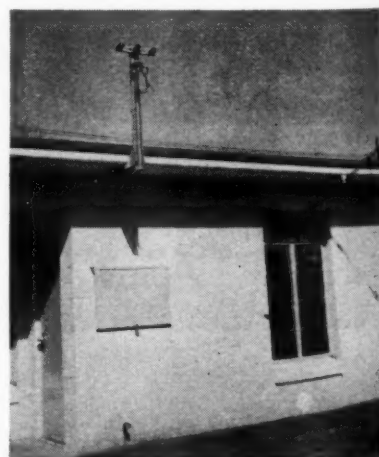
the rear of a double dwelling in an inset panel accessible from the outside of the building. Since utility requirements call for a separate meter on water heating, a double meter trough and a multibreaker assembly was made up into each unit. Under the Code provisions for six subdivisions of load, the circuit breaker assembly consisted of a 50-amp. breaker for range, 25-amp. breaker for water heater, a 20-amp. breaker for lighting circuits and a 20-amp. spare. Installed in a shallow compartment, this compact arrangement saves space, provides an accessible location for metering and makes a neat installation. Usually the cabinets are combined with a telephone cabinet just below that for the service equipment.

Each dwelling unit is equipped with an electric water heater, a 1½-kw. bathroom heater and an electric refrigerator. An outlet is installed for the electric range. All convenience outlet circuits are wired with No. 12, the individual apartments having 27 outlets for a three-room dwelling. Most of the circuit wiring is in ¾-in. flexible conduit.

LOW BUILDING ENTRANCE

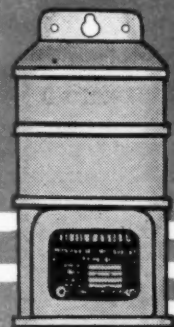
Where roof lines on single story buildings are almost within reach of the ground, service wires must terminate higher than the roof. The Wright Bros. Electric Co. of San Antonio, Tex. used a neat metal bracket assembly for this purpose on the Alazan Court housing project in San Antonio.

An L shaped bracket was made using 3-inch channel iron. The corner was



RAISED ENTRANCE on a neat metal bracket holds service conductors above low roof.

230—460—575 VOLT POWER CIRCUIT



230 - V
115 - V
115 - V

Lower Voltage Circuits For...

- Lighting,
- Electric Tools, such as welders, drills,
- Fans,
- Heating Appliances, such as glue pots, soldering irons,
- Relays, and other 115 or 230 volt appliances or devices.

USE THIS METHOD TO SPEED WIRING INSTALLATIONS AND REDUCE COSTS

SPEED is necessary in present wiring installations and for large building and manufacturing plants, the old practice of running duplicate power and lighting circuits has been eliminated.

Today only the higher voltage power circuits are installed and power circuit transformers are located at convenient points to supply the lower voltages required for lights, fans, electric tools, etc.

Copper, conduit fittings and labor are saved; time of installation reduced; and only one service entrance required.

Jefferson Power Circuit Transformers are used in many of the outstanding buildings erected during the past five years—and their long-life dependability and high efficiency have been proven on the job. They may be installed wherever desired—no separate compartments being required—no fire hazard.

Bulletin 401-PCT contains all essential data—a copy will be mailed on request. JEFFERSON ELECTRIC COMPANY, Bellwood (Suburb of Chicago) Illinois. Canadian Factory: 60-64 Osler Avenue, West Toronto, Ontario.



JEFFERSON
ELECTRIC
POWER CIRCUIT
TRANSFORMERS
AIR-COOLED



WRITE FOR COPY
OF NEW BULLETIN
401-PCT.

FOUR POINT ECONOMY—



Above: Type CFT, three-phase, outdoor-type, air-cooled, general-purpose transformer.

Below: Type CF, Single-phase, outdoor-type, air-cooled, general-purpose transformer.



- 1**
LOW INITIAL INVESTMENT
- 2**
EASY TO INSTALL
- 3**
MINIMUM MAINTENANCE
- 4**
EFFICIENT IN OPERATION

Whenever it is desired to obtain a low-voltage supply from a higher voltage circuit you will find AmerTran Type "CF" Air-Cooled Transformers both economical and convenient to use. These moderately priced units may be installed wherever they are needed—either outdoors or indoors*—without the necessity of oil, fire-proof vaults or enclosures. All sizes are equipped with either conduit fittings or a built-in junction box to facilitate installation, and both single-phase and polyphase types are furnished as a single unit. Available in capacities up to 100 Kva. and for potentials up to 2400 volts, all ratings offer low initial investment, minimum installation and maintenance expense, and low operating cost. Let us send data on equipment to meet your needs. Ask for bulletin 1116A.

* Units rated 15 Kva. and larger for indoor service only.

Type "CF" Applications

1. Stepping down power circuit voltage to 115/230 volts for lights, small motors or heating elements. In this way advantage may be taken of lower power rates for low-voltage loads.
2. Obtaining a 3-wire circuit from a 2-wire system.
3. Changing from 3 phase to 2 phase, or vice versa, on a power system.
4. Obtaining low voltage for heating, welding, 32-volt tools, special lighting, testing, etc.
5. Balancing load on 3-phase systems.
6. Insulating one circuit from another.
7. Distributing power at 600 volts or less.
8. Reducing light flicker.
9. Obtaining special voltages to permit efficient operation of equipment.

AMERICAN TRANSFORMER COMPANY

178 Emmet St.

Newark, N. J.

AMERTRAN

Manufactured
Since 1901
at Newark, N. J.

TRANSFORMERS

PRODUCTS

American Transformer Co. manufactures transformers for every industrial, electronic and laboratory application in sizes up to 10,000 Kva and for potentials up to 132 Kv. Other products: voltage regulators, test sets, rectifiers.

WIRING Methods

[FROM PAGE 38]

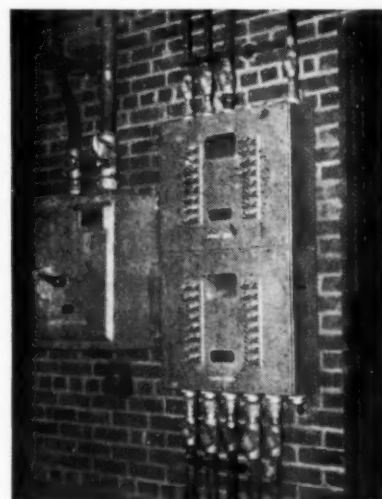
reinforced with metal triangles welded in place. The bracket is supported on preset anchors under the eaves and extends three feet above the roof line.

A conventional house bracket is bolted to the top. Service conductors in conduit extend up the bracket terminating in a conventional service head.

DISTRIBUTION PANEL IN HAZARDOUS AREA

The lighting distribution center for one of the buildings of an oil cracking plant is located on the outer wall of the instrument and control room just along side of the door. It is also convenient to an outer stairway which leads to the top of the building where the power and lighting transformers and main switches are located.

Here, where the explosive component of the atmosphere is apt to be less con-



NO DANGER of electrical spark ignited fires in this oil cracking plant. Lighting distribution equipment and control is mounted outdoors in a vapor-proof enclosure.

centrated, the M. W. Kellogg Company, oil refinery contractors and engineers of New York City, mounted vapor-proof lighting distribution equipment. This equipment consists of an incoming line breaker and watt-hour meter mounted in a vapor-proof enclosure with a glass window for reading the meter. Two 16 circuit vapor-proof circuit breaker lighting distribution panels mounted end-to-end control the lighting circuits in the building.

To localize any arcing which may occur, sealing fittings are inserted in the conduit lines wherever they enter or leave the circuit breaker enclosures.

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LEADERS in their FIELD

- ① First to be Wrapped and SEALED in Cellophane.
- ② Perfect Adhesiveness and Tensile Strength.
- ③ Strong Distinctive Green Core.
- ④ Colorful Attractive Boxes.
- ⑤ A Company in the Insulation Business Since 1878.

**Sold Exclusively Through
Distributing Wholesalers**

HAZARD INSULATED WIRE WORKS

DIVISION OF THE OKONITE CO.

Wilkes-Barre, Pa.

Offices in Principal Cities



PANTHER and DRAGON

Friction and Rubber Tapes

Better Lighting

LIGHTING A TAILOR'S SHOP

I. B. Simpson, Inc., small Chicago merchant tailor, has used daylight fluorescent lamps for the display of his colored fabrics. There are fifteen 30-watt lamps in Solar Alzak trough reflectors. These provide between 25 and 100 footcandles on the fabric display. The general lighting is provided by eleven 300-watt Solar units mounted 9 feet above the floor and spaced 11 feet apart.



TAILORED LIGHTING for tailored clothes, with daylight fluorescent lamps doing a 25-100 foot-candle job in the fabric display cases of this Chicago tailor shop.

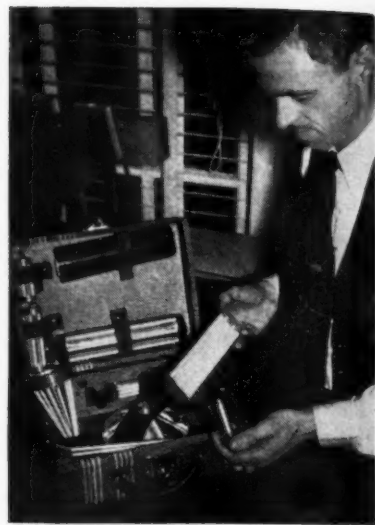


COLOR PHOTOS of fluorescent lighting installations are shown with this tiny flashlight viewer. Wm. Grace, Jr. demonstrates.

LIGHTING SALES HELPS

Tackling the problem of selling fluorescent lighting equipment Wm. Grace Jr. of the Grace Engineering Co. of Dallas, Tex., found that relatively unfamiliar equipment like fluorescent fixtures require something to bridge the gap between catalog presentation and actual trial installations.

Two sales helps were worked out that have proved very effective. Colored



SAMPLE KIT of scale models of several fluorescent units paves the way for trial installations.

photos of installations on miniature slide transparencies are shown by means of a small viewer. Flashlight batteries and lamps illuminate a small diffusing screen over which the pictures are shown. A trigger drops the slide into a receptacle making way for the next slide.

Next step is the display of a sample kit of miniature scale models of several styles of fixtures. Light gage metal form the fixture bases and frames, glass tubing coated white inside simulate the fluorescent lamps.

MORE LIGHT

MADE POSSIBLE

Flourescent lighting units solved a difficult lighting problem inside the huge anchorage structures at each end of the Golden Gate Bridge in San Francisco. Original layout provided only 1,500 watts which was distributed in fifteen 100-watt lamps. In the great spaces this proved far too little light for safety in inspection and patrolling. Transformer capacity was loaded.

Incandescent lights were removed and 20-watt, 24-in. white fluorescent lamps to the total capacity of the 1½-kw. transformers were installed instead with far better spacing. Much new conduit was run for this purpose, exposed and fastened to the heavy con-



LIGHT DRAFTED—More than three miles of continuous strip fluorescent lighting fixtures are installed on ceilings in the new Westinghouse Building in Lester, Pa., near the South Philadelphia Works. This drafting room is 300-ft. long by 100-ft. wide and the illumination on the drawing boards measures 50 foot-candles intensity. The light in the general office averages from 30 to 35 foot-candles.

For INDIVIDUAL or CONTINUOUS RUN Installations



TOMORROW'S PROFITS
PROTECTED BY TODAY'S
TIMELY PURCHASES

RLM

TWO AND THREE-LAMP UNITS

Consist of a wiring channel and separable porcelain enameled reflector body. All lamp holders, removable starter switches, high power factor ballasts, compensator and wiring, are part of wiring channel assembly.



INDIVIDUAL OR CONTINUOUS RUN INSTALLATIONS



Two and Three-Lamp RLM Units can be mounted individually from chain or conduit; or can be used to make Continuous Run installations. Only a few extra parts required to convert units into continuous installations of any number of units desired.

WHEELER TWO LAMP RLM THREE LAMP FLUORESCENT UNITS

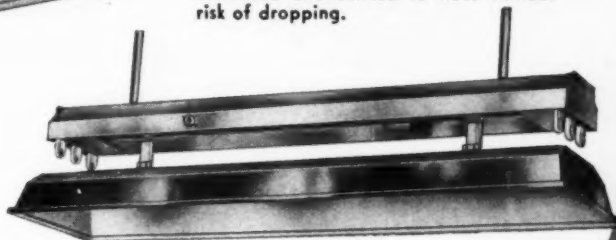
For Use with 48-inch, 40-watt Lamps

Wheeler RLM Two and Three-Lamp Fluorescent Lighting Units are designed to provide general and localized illumination in industrial and commercial areas. Both units identical except for additional ballast and lamp holder necessary to operate three-lamp unit.

For use with white or daylight lamps, in locations where economical, efficient lighting is required—Color-corrected light—cool in operation—easily installed and serviced.

EASY MAINTENANCE

Two sliding hanger straps are secured to inside of wiring channel, with lower ends terminating in hook that engages a loop on top of reflector body. To take down reflector, remove two wing nuts and lower body to limit of extended hangers. From this position reflector is easily unhooked and carried to floor without risk of dropping.



WHEELER REFLECTOR COMPANY

BOSTON · MASS.

For complete information on
new units, write for copy of
Wheeler Bulletin No. 66.

A Formal Presentation of the

"IT HARMONIZES
WITH MODERN
TREATMENTS IN
ARCHITECTURE"

"I'LL NEVER BE
SATISFIED WITH
ANYTHING ELSE"

"FLUTED GLASS
CYLINDERS—THAT'S
A REAL FEATURE"

The Kingsway

*BE prepared for a surprise!
For you will have to revise
your ideas about fluorescent
fixtures when you see what
Day-Brite now has to offer
in these modern new units.*

Taking the "excitement" of fluorescent lighting for granted, Day-Brite engineers and designers stepped clear away from the field with the "Kingsway." This fixture is entirely new. New in its graceful lines—new in its use of specially designed fluted glass cylinders and die-cast ends—new in its unique method of construction for easy installation and servicing. New also in its instant appeal to your customers who already place the name "Day-Brite" high in the scale of fluorescent fixture values.

The "Kingsway" is available in units—2, 4, 6 and 8 feet long; also continuous. For two and three lamps parallel.

Designs patented—Trade-marks registered



DAY-BRITE

LIGHTING, INC.
5412 Bulwer Ave., St. Louis, Mo.

NEWEST in Fluorescent Fixtures



The Day-Lume

To appreciate the creative skill represented by the "Day-Lume," this fixture should be seen *unlighted*. In action, its smooth plastic body and molded plastic ends give such an effect of a softly glowing fluorescence that the design and details of the fixture itself blend with the illumination pattern to combine eye appeal with eye-rest value! Distinctly the fixture for any modern structure, or where the authentic touch of modernization is being added to existing areas.

Sizes . . . Suspension Type: four 40-watt, eight 40-watt, two 100-watt, three 100-watt, four 100-watt and six 100-watt lamps.
Ceiling Type: four 40-watt and eight 40-watt lamps.

Shipments will be made starting June 1st



SEND FOR FULL INFORMATION

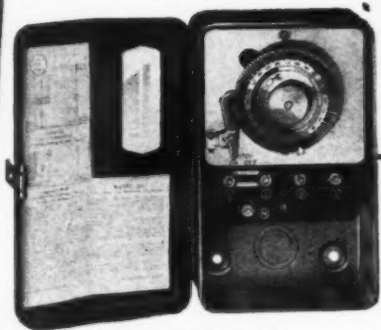
All information on design, structural details, efficiencies, illumination characteristics and dimensional data on these new fixtures is contained in new bulletins now in preparation. Write today and reserve your copies.

MANUFACTURERS OF...

The Complete Line of **FLUORESCENT LIGHTING FIXTURES**

Paragon
TIME SWITCHES
offer

PROFIT
WITHOUT
TROUBLE



Paragon Series 300

Here's Why...

Paragon Series 300 Time Switches: (1) are easy to install and set, (2) requires practically no service, (3) are guaranteed to operate properly in temperatures as low as 20 degrees below zero, (4) positively not affected by dust, (5) highest type of design and construction.

only \$13⁰⁰ list

Liberal discounts. Approved by Underwriters. Sold by Electrical Supply and Sign Supply Jobbers. Send for a bulletin.

Series 300 is the one and only time switch with just two gears in the open.

PARAGON ELECTRIC CO.

Builders of
Control Instruments since 1905

401 S. DEARBORN ST., CHICAGO

Better Lighting

[FROM PAGE 42]

crete girders. Mounted high there is little objectionable glare on the units which are backed with an Alzak aluminum reflector.

THE ANSWER—There was insufficient capacity to increase lighting found inadequate under Golden Gate Bridge, San Francisco. But fluorescent lamps solved the problem.

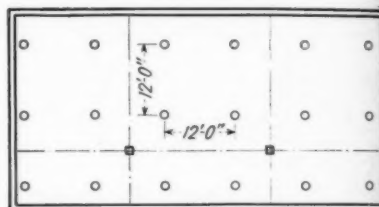


Lighting a HOSIERY KNITTING ROOM

PROBLEM—To provide adequate illumination, with a minimum of glare and sharp shadows, for supervising the operation of automatic knitting machines.

CONSTRUCTION DATA—The building is of steel and concrete construction with concrete encased columns and beams. The area occupied by the knitting machines is 156 feet long by 72 feet wide and has a 13-foot ceiling height. Ceiling, walls and columns are painted flat white.

SOLUTION OF PROBLEM—General illumination is provided by totally indirect Alzak aluminum reflectors, each with a 500-watt inside-frost general service lamp. The units are mounted 9-ft. 6-in. above the floor and are spaced on 12 foot by 12 foot centers. Wiring is in exposed conduit.



PLAN VIEW showing the location and spacing of the indirect lighting units in the knitting room.

RESULTS—The average uniform illumination intensity two weeks after installation was 25 foot-candles, which is ample for the operator to see the thread, detect drop stitches, flaws and to align the needles during the knitting operation.

INDIRECT INCANDESCENT lighting provides sufficient illumination for this mill.



nd
its
ation
s 25
rator
flaws
itting

**We are doing a good
job of supplying 100% production
without sacrificing quality**

Sherarduct
"it bends"

Dilec
"smallest diameter"

A.B.C Cable
"genuine"

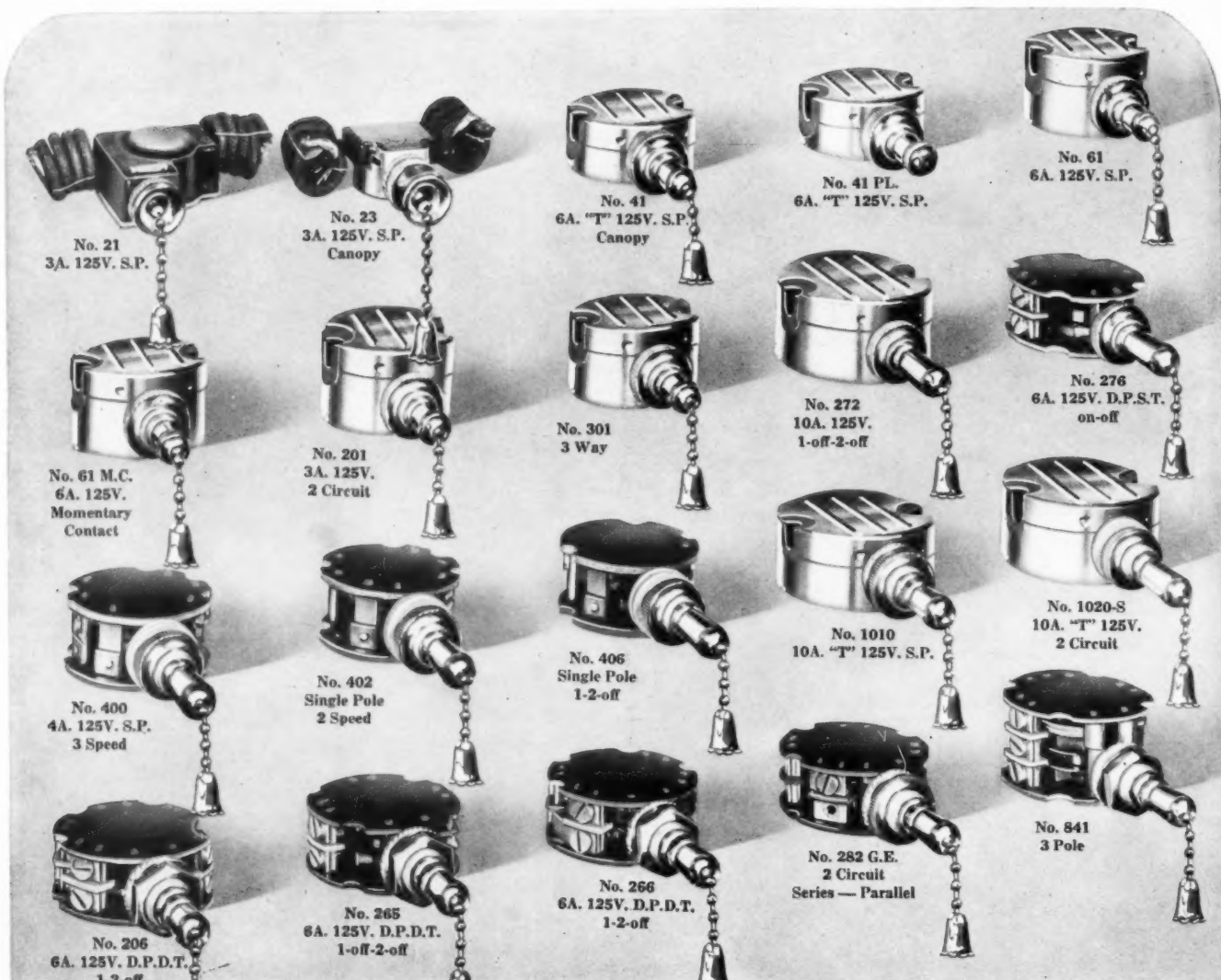
Redbox
"perfect boxes"

Gorilla Grips
"precision fit"

National Electric Products Corp.



Pittsburgh, Pa.



McGILL *Levolier*

A Switch for Every Fluorescent Lighting Problem

Don't risk your reputation or that of the Fluorescent Lighting Manufacturer by installing anything but the best in switches. To replace a switch in a Fluorescent fixture is expensive and troublesome. With McGill Levolver Switches dependability is assured, for back of each switch are years of experience and an unsurpassed record for trouble-free operation in practically every type of installation.

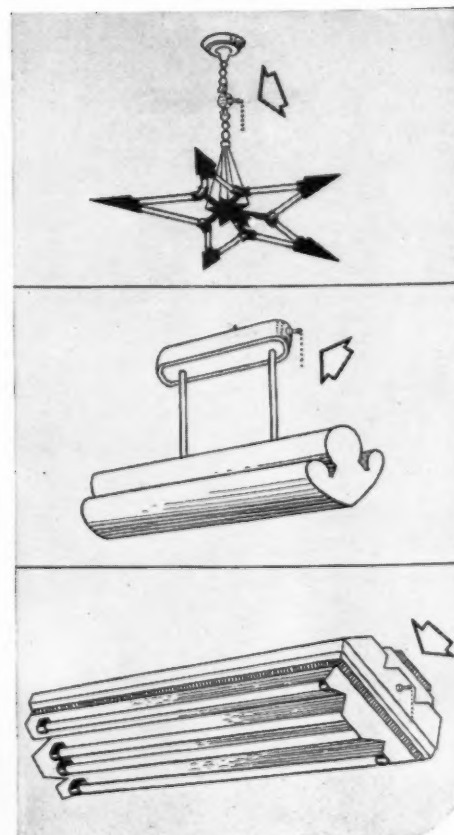
McGill Levolver Switches In Use Today In Fluorescent Units

No.	Amp.	Volt	Control
39	6-A	125-V	link type, on and off
41	6-A	125-V	on and off
1010	10-A	125-V	on and off
276	6-A	125-V	on and off double pole
1020	10-A	125-V	lights any two tubes, or all four, and off
1029	10-A	125-V	link type—lights any two tubes, or all four, and off
1039	10-A	125-V	link type, on and off

McGILL Levolver Switches — Recommended by many leaders in the Fluorescent Lighting Field, some of which we are listing below:

Goodrich Electric Company, Chicago, Illinois
 Garden City Plating & Mfg. Co., Chicago, Ill.
 Art Metal Company, Cleveland, Ohio
 DayBrite Lighting, Inc., St. Louis, Missouri
 Benjamin Electric Mfg. Co., DesPlaines, Ill.
 Edwin F. Guth Company, St. Louis, Missouri
 F. W. Wakefield Brass Co., Vermillion, Ohio
 Hygrade Sylvania Corp., New York City, N. Y.
 Wheeler Reflector Co., Boston, Massachusetts
 Curtis Lighting, Inc., Chicago, Illinois

McGILL MANUFACTURING COMPANY
 Electrical Division VALPARAISO, INDIANA





[FROM PAGE 46]

LIGHTING A RESTAURANT

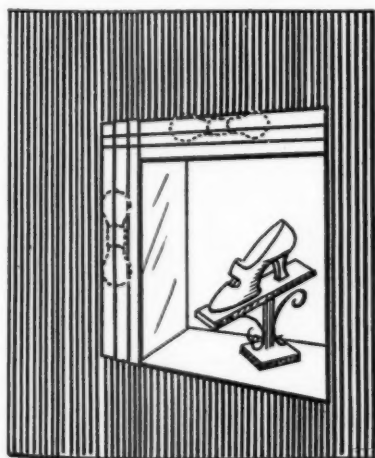
The lighting in the Paramount Studio Restaurant is modern and original. The area lighted is 80 feet long and 45 feet wide and 14 feet high. Cove lighting was used.

There is a single row of 104—36-inch daylight fluorescent lamps, with

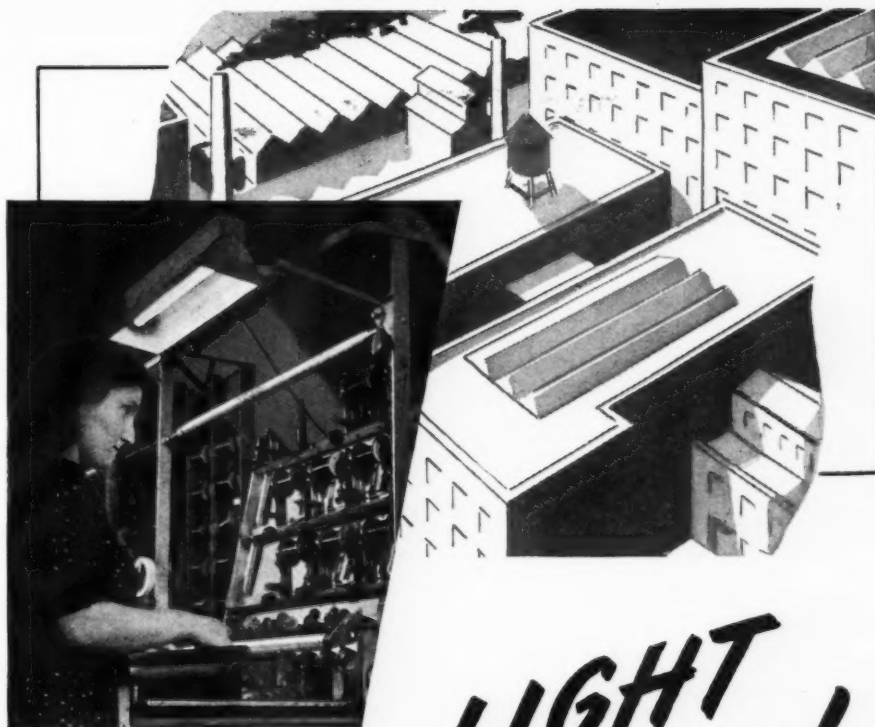


FLUORESCENT COVES and dome units provide 10 foot-candles of cool light in this restaurant.

four 18-inch lamps on the curve. The dome units which have been worked into the design, are each equipped with six 24-inch daylight lamps. This system, replaced 200 watt enclosing globes on 12-ft. by 14-ft. centers. It provides approximately 10 footcandles of "cool daylight illumination."



DISPLAY NICHES—Small illuminated niches or cubicles built into a background or set-piece, add interest to the window and draw attention to small articles without detracting from the principal display. In this cubicle, the top and the left side could be opal glass to diffuse the light from concealed lamps. While the sketch shows filament lamps, fluorescents can be used.

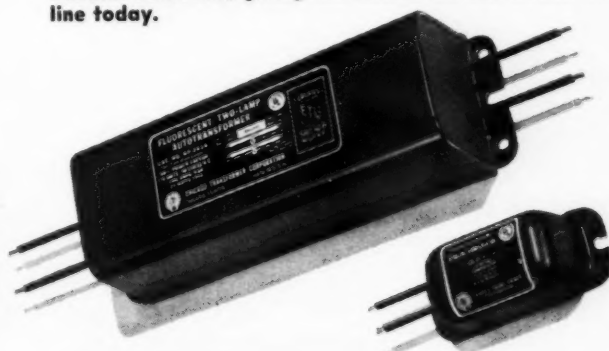


Where LIGHT must be right!

SPECIFY FLUORESCENT LAMP BALLASTS BY CHICAGO TRANSFORMER

Never before has the right light been so important for a right job.

With American industry geared to a staggering production pace, there's no time for lighting failures to disrupt schedules—for faulty lighting to endanger accuracy and safety. That's why Ballasts by Chicago Transformer are used in more industrial Fluorescent Installations every month. For Chicago Transformer Ballasts mean dependability where light counts most—Dependability assured by laboratory tests for heat tolerances, Watt delivery control, hum requirements, and wave shape tolerances and long lamp life. Write for new bulletin FBB-0430, giving full details on the entire Chicago line today.



CHICAGO TRANSFORMER CORPORATION
3505 WEST ADDISON STREET • CHICAGO

Motor Shops

SUSPENDED GROWLER

A large growler, used for testing heavy, d.c. armatures, is supported in a handy overhead arrangement at the Cleveland Electric Company in Birmingham, Ala.

The growler is suspended above the



HEAVY GROWLER is suspended over the working area with counterweight balance for easy handling.

working area on a $\frac{1}{4}$ -inch wire rope running over two pulleys to a balancing counterweight. It is connected to the power circuit by a flexible cord and can be readily raised or lowered with one hand.

COMBINATION GAS AND ELECTRIC BAKE OVEN

The Standard Electric Motor Repair Co., of Linden, N. J., has designed and built a combination gas and electric heated oven for use in its shop.

It is of welded sheet steel construction and measures four feet square and 43-inches high. The sides are filled with 2-inches of asbestos insulation while the top consists of a 4-inch deep air chamber. The bottom is



GAS OR ELECTRIC heat can be used for baking in this oven. Time clock arrangement controls either gas burners or electric heating units.

made of a $\frac{1}{4}$ -inch steel plate which forms the top of an 8-inch deep brick chamber enclosing five gas burners.

Fifteen pieces of 3-inch boiler tubing, mounted adjacent to the inside walls, connect the gas chamber with the air chamber on the top of the oven and provide a passage way for hot air circulation when gas firing is used. Two exhaust vents are mounted on top of the oven, one entering the air chamber to form a natural draft, the other entering the oven proper to exhaust fumes. The intensity of the draft is regulated by two notched levers, one for each vent, mounted on top of the oven.

For electric baking, the oven contains four 1000-watt coil wound, cone type heaters, two on each of two sides of the oven. They are located between



INTERIOR OF OVEN showing the air tubes and mounting of electric heaters (see arrows). Trays and tray supports are yet to be added.

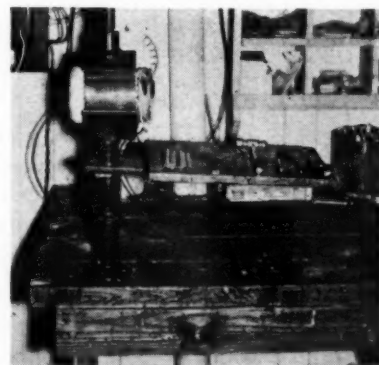
the air tubes and mounted, base inward, on a strip of flat iron welded to the tubes. Each unit is individually controlled by a toggle switch mounted on the outside of the oven. A main disconnect switch controls all units. A red pilot light indicates when any one heater is on.

Automatic electric control is accomplished through the use of a time clock, installed ahead of the main oven switch and mounted conveniently on a wall near the oven. This clock also controls the gas burners through an electrically operated automatic gas valve. So, definite baking periods can be had for either gas or electric heating.

TOOL PLATFORM

A shelf for slot insulation and small tools is directly attached to the stator vise at the Russell Electric Co. shop in Mobile, Ala. and may be swung around to any convenient position.

The shelf is 14- by 10-inches and



TOOL SHELF swings around stator vise for handiest working position and holds insulation and small tools.

supported on a flat iron bar drilled at one end to a tight fit on the $\frac{1}{4}$ -inch pipe supporting the lower jaw of the stator vise. The shelf is eight inches above the bench level to clear parts or tools that must be stacked close by.

SPOOL SPINDLES

One of the minor aggravations of life in the motor shop is lost or misplaced spool spindles. For speedy winding the fit must be good and any old piece of pipe won't do. Ingenious mechanics at the San Antonio Armature Works of San Antonio, Tex. worked out the neat little reel rack shown in the accompanying photo so that spindles stay put.

SELL *Speed*

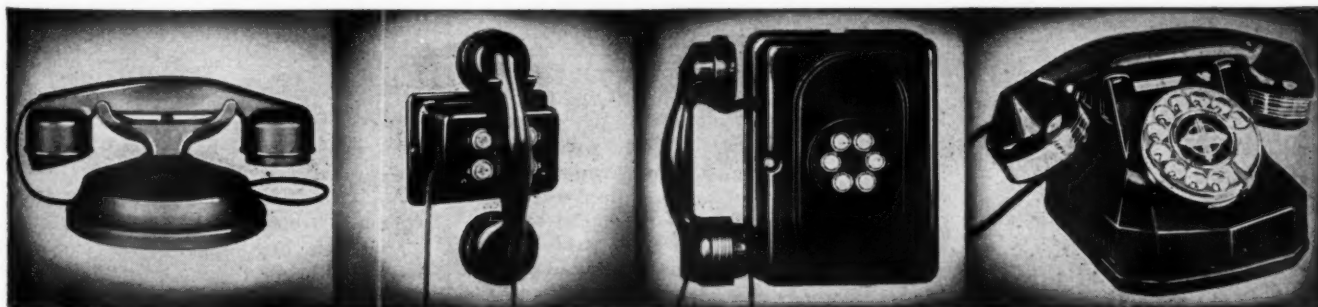
Because Automatic Electric private interior telephone systems provide a means of speeding production, they are more in demand now than ever before.

Only when fast interior communication links all departments is a company really geared to run at full tilt. Automatic Electric telephones, in furnishing direct, convenient service, insure teamwork. That means maximum production.

Tell your customers about the Automatic Electric line of private telephone systems. Four of the most popular types are presented here. These and others are fully described in Catalog 4033-A.

See your electrical wholesaler for further information on this profit-yielding equipment—today!

Automatic Electric intercommunicating systems are designed for private service. They are not intended to be connected with the public telephone system.



SERV-U-FONES

Low priced, all metal telephones, in common talking systems of two to ten stations. Conveniently packaged and simple to install.

IDEALFONES

Wall-type with molded handsets. Offered with one or five buttons for common talking service up to ten stations.

INTERCOMS

Supplied in both desk and wall styles—with molded plastic handsets. Common talking systems of two to eleven stations.

P-A-X's

Private automatic exchange systems, providing dial service and secret connections, from ten stations up. Telephones in a variety of types.

AUTOMATIC ELECTRIC

PRIVATE INTERIOR TELEPHONE SYSTEMS

Distributed by: AMERICAN AUTOMATIC ELECTRIC SALES COMPANY, 1033 West Van Buren Street, Chicago, Illinois
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Electrical Contracting, May 1941

SAVE TIME ON DUCT INSTALLATION



use J-M TRANSITE DUCTS

• No other cableways offer all the time- and money-saving advantages of J-M Transite Ducts. Made of asbestos and cement, they are light in weight, easy to handle.

Crews like the simplicity of the Harrington Couplings used for assembly, for screwing or threading is eliminated . . . joints go together fast . . . drive up tight. Cable pulls are fast and easy because of Transite's unusually smooth bore. There's no need for preservative treatment. And, on the job, Transite Ducts keep operating and maintenance costs low, for their mineral composition provides fire-safety and unusual resistance to weather and corrosive fumes.

Why not get full details? Just write for brochure DS-410. Johns-Manville, 22 East 40th St., New York, N. Y.



Transite Conduit on Ballard Street Bridge, Seattle, Wash. Inset shows how Transite Korduct nipples are cast in concrete beams through which the conduit passes. **Electrical Contractor:** NePage Electric Co., Seattle.

JM Johns-Manville TRANSITE DUCTS

TRANSITE CONDUIT . . . for exposed work and for installation underground without concrete encasement.

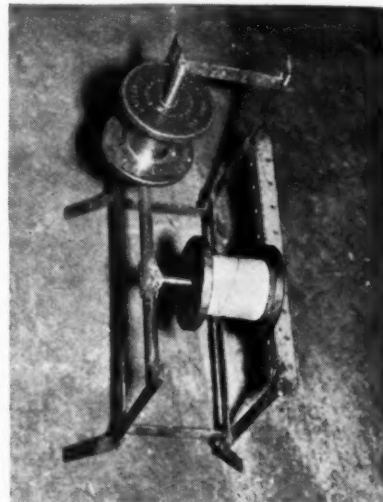
TRANSITE KORDUCT . . . for installation in concrete. Thinner walled, lower priced, but otherwise identical with Transite Conduit.

Motor Shops

[FROM PAGE 50]

One side bar of the rack is a $\frac{3}{4}$ -inch round rod, the opposite side a $1\frac{1}{2}$ -inch angle. Spindles are welded to a T at one end. The T fits snugly on the round side bar and cannot be removed.

Spools are easily set into the rack by



SPINDLES STAY put by permanent T at one end. Free end may be lifted to remove spool.

lifting one end of the spindle off the angle and sliding the spool on. Dropped back into place a device anchors the free end of the spindle.

AUXILIARY BAKE OVEN

A small auxiliary electric bake oven has been constructed by the Phoenix Electric Co., a motor repair shop in Youngstown, Ohio. It is used principally for small odd job work when there is insufficient volume of work to warrant the use of either of their two large gas fired ovens.

The oven, originally a two compartment coil heater type oven in a bakery shop, is 40-inches high, 35-inches wide and 45-inches deep. It stands 29-inches above the floor. The compartments and coil heaters were removed and the double door consolidated into a single door. Four 1000-watt strip heaters were installed to operate in a series-parallel circuit on single phase 220 volt current. The oven is thermostatically controlled by a temperature regulator and has two switches to give two ranges of heat for both the lower and upper set of heater units.

The inside of the oven is equipped with a flat truck with wheels made

3 great Fluorescent lighting benefits!

1. All the light you need now
2. Quicker, less expensive installation
3. Freedom to rearrange operating equipment without changing lighting

TO ELECTRICAL CONTRACTORS!

The Miller Company feels that the best way it can work with you is to put before your customers and prospects the story of the direct benefits to them of the IVANHOE Fluorescent "50 FOOT CANDLER" Lighting System. This particular advertisement will reach more than 500,000 of them during May—as part of Miller's regular monthly planned program to help you.

... with IVANHOE "50 FOOT CANDLER" RLM *Continuous Wireway* FLUORESCENT LIGHTING SYSTEM

● IVANHOE FLUORESCENT "50 FOOT CANDLER" offers these 3 great lighting benefits to key industries—aviation plants, textile mills, manufacturing plants of all types. IVANHOE "50 FOOT CANDLER" will do these profitable things for you because it is *not* a lighting fixture but a *lighting system*...the first RLM *Continuous Wireway* Fluorescent Lighting System providing new higher levels of illumination at economical cost.

In one case, for example, a well-known manufacturer made a net saving of \$8,000! In another, a key Defense plant, the operating cost of "50 FOOT CANDLERS" was but a fraction of a cent per man-hour of production! In still another case, exclusive features of the "50 FOOT CANDLER" gave the user the option of adding a third lamp for a 45% increase in illumination when, as and if he needed it!

Think what similar benefits could mean to you in your plant right now! Then...

Write today for new "50 FOOT CANDLER" Bulletin 1C.

IVANHOE

THE MARK OF A
COMPLETE LIGHTING SERVICE

THE MILLER COMPANY
MERIDEN, CONN.

Pioneers in Good Lighting Since 1844



THIS FAN CONTROL IS BUILT FOR SUMMER HEAT



THE well planned arrangement of Ward Leonard Speed Regulators provides circulation of air around resistance elements to dissipate the generated heat. They will therefore operate continuously at any speed setting, in the hottest weather, without overheating. Ward Leonard Motor Speed Regulators include everything from small ring type rheostats for window ventilators to the heaviest industrial blower controls. Multi-Speed Motor Starters available for air conditioning.



Ring Type
Rheostat 1105

Bulletin 1101

describes Ward Leonard Speed Regulators, ventilated and enclosed types, 1/20 to 1/3 H.P.

Bulletin 1105

describes Ward Leonard Vitrohm Ring Type Rheostats 1 1/2", 2 1/4", 3" and 4" diameters for 25, 50, 100 and 150 watts.

Bulletin 4061

describes Multi-Speed Starters.

EXTRA HEAVY DUTY

Special information upon request.

WARD LEONARD

Electric Control Devices Since 1892

Ward Leonard Electric Co., 28 South St., Mount Vernon, N. Y.

Please send me Bulletin Nos.

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Motor Shops

[FROM PAGE 52]

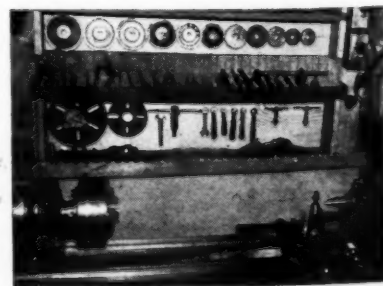
of four discarded ball bearings which ride on a channel iron track. When the oven door is open the truck can be pulled out on a track extension, the dipped equipment placed on the truck and rolled into the oven. Motors up to 50 hp. in size, depending upon speed of course, can be handled in this small oven.

Adjacent to this oven is a sub-floor dipping tank 42-inches long, 36-inches



SMALL AUXILIARY electric oven for odd job work and an oil seal on the dip tank increases profits in this motor shop.

wide and 40-inches deep. The top of the tank, which is flush with the floor, has an evaporation seal of transformer oil which rests in a 3-inch by 3-inch trough around the entire top of the tank. An angle iron flange on the bottom side of the steel tank cover dips into the oil seal when closed and prevents dirt and dust from entering the tank and prevents evaporation of the varnish in the tank.



GOOD HOUSEKEEPING is the rule in the Solliday Electric Shop, Allentown, Pa. One example of strict adherence to this principle is the shelf and rack built above this small lathe to hold the cutting tools, gears and other accessories. It helps save time and labor and cuts costs.

WESTINGHOUSE supplies the answer



100 footcandles of Supplementary Fluorescent Lighting provide comfortable and profitable precision seeing for this industrial workman.

FLUORESCENT Equipment for "LOCAL" Lighting Jobs

"Putting the light where it's needed"—without glare—without annoying heat—is just as practical for supplementary lighting as it has been for years with general lighting . . . thanks to Westinghouse Fluorescent Lighting equipment.

Because it is 50% cooler, Westinghouse Fluorescent Lighting may be placed much closer to the work—yet radiating heat is negligible, and harsh glare and shadows are eliminated. With its greater efficiency, low brightness and extended light source, Fluorescent Lighting may provide 150 footcandles or more of supplementary illumination, economically and without annoyance to workmen. With "daylight" type lamps, it approximates standard daylight—an important feature in inspection and color discrimination.

Westinghouse makes a complete line of industrial fluorescent fixtures, including the 40-watt and the new 100-watt size reflectors. Your local Westinghouse Distributor will be glad to help you select the most suitable equipment for your lighting problem. Westinghouse Electric & Manufacturing Company, Edgewater Park, Cleveland, Ohio.

117 Westinghouse Electric Supply Company Offices and Independent Lighting Distributors provide local stocks and services.

Westinghouse

Lighting Equipment





IT COMES AS A SURPRISE

when you get the bill for plant and labor tie-up due to circuit interruption from inefficient fusing. And what makes it worse is, that there has long been a remedy for inefficient fusing, and for its needless difficulties and expense. All you have to do to be rid of them for good is to install

SHAWMUT
SHUR-LAG

RENEWABLE FUSES

for a Shawmut fuse is the fuse to use when you want the maximum of efficiency in operation and protection.

Shawmut Shur-Lag Renewable Fuses are the simplest, sturdiest, and most serviceable time-lag fuses made. They have a dozen or more features that



place them far ahead of all other time-lag fuses in economy and convenience — features resulting from an experience in circuit protection extending over nearly half a century. One of these features—unique of its kind—is the remarkable Shawmut Renewal Link, which gives correct time-lag without the use of welded plates; it is of uniform thickness throughout its length, and the quickest, easiest, and handiest of all renewal links to remove or insert. For full information about Shawmut Shur-Lag Fuses, ask your dealer, or write for our Bulletin 400.



THE CHASE-SHAWMUT COMPANY

NEWBURYPORT, MASSACHUSETTS

FUSE MAKERS SINCE 1893

Industrial Electrification

EQUIPMENT TO LOWER UNIT COSTS

MAINTENANCE

EQUIPMENT TO LOWER UNIT COSTS

AS stated last month, one of the major problems of modern industrial management is the continued reduction of unit production costs. At that time, a review of the possible applications of electricity to production lines was made. With that as a background, the present discussion is designed to illustrate what equipment can be used to accomplish these results.

Again, it is the responsibility of the maintenance man to familiarize himself with the type of electrical equipment available and its application. His is the overall picture of plant operation. And with his knowledge and experience as a background, he should know where the introduction of electrical operations would benefit production most. But knowing how, where and why is not enough. He must also know what to use.

The following pages present a number of case studies of the application of electrical equipment to heating operations, material handling and special applications—all of which materially reduced unit production costs. Although used in specific industries and processes, these case studies merit the consideration and study of all maintenance men. For these very methods may be readily and profitably applied to the reader's own plant. The accompanying Maintenance Guide Sheet contains formulae, curves and examples for determining energy and power requirements for heating specific substances.

Previous articles covered—

1. Simplifying electrical maintenance
 2. Preventive Maintenance of Distribution Systems
 3. Preventive Maintenance of Electrical Equipment
 4. Reducing Power Costs
 5. Maintaining Good Power Factor—Part I
 6. Maintaining Good Power Factor—Part II
 7. Meeting Severe Service Conditions
 8. Eliminating Causes of Severe Service Conditions
 9. Providing Adequate Capacity for Increased Demand
 10. Electrifying Operations to Reduce Unit Costs
 11. Electrical Equipment that Reduces Unit Costs (this issue)
- Future articles will discuss—
12. Increasing Flexibility of Electrical Service
 13. Safety Protection for Electrical Operations
 14. Extending Automatic Control
 15. Methods for Handling Changeovers and Live Circuits

ELECTRICAL EQUIPMENT THAT REDUCES UNIT COSTS

DURING the past decade when business was at low ebb, industry found ways to reduce production costs. One important way was by the use of electric equipment. Now, in these days, when production and industrial plants are expanding, electric power and equipment play an even more important role.

For with all the present-day activity, prices must be kept in line. Operation and production still must be on a basis so that a fair return can be made on the investment.

The progressive electrical maintenance man helps keep prices in line, when he takes an interest in individual machine and process operations and in over-all plant operations. He becomes a valuable asset when he can show the management how to maintain a uniform quality of product, how to increase production, how to save time, reduce losses, salvage material. All of these have a direct bearing on production costs and plant output.

There are two angles from which the maintenance man can view the subject of electrifying operations to reduce unit costs. The first is from the standpoint of individual operations in the plant. This approach was discussed here last month. The second is from the standpoint of electric equipment. In this approach, we classify types of electric equipment, such as, for electric heat treatment, electric space heating, motor drive, motor control, individual circuit control, lighting, safety protection, power distribution, and then special equipment or devices.

The first step is to go over the list and pick out the items of electric equip-

ment that will do the work. By studying the characteristics and functioning of these devices, the selection can be narrowed down soon to an individual unit that is suitable for each particular operation.

Operations are too various and equipment classifications are too numerous to list them all here. However, there are several classes that are applicable in many plants. Also, experience gained in one plant is well worth consideration for another. Typical of such classes are—

1. Electric Heating Equipment

Heat is required in many industrial operations and processes. Numerous methods have been devised to generate heat but there are only three ways by

IMMERSION HEATERS in lead pot. Three 5-kw. units keep metal at exact casting temperature of 650 F., insuring better work.





ELECTRIC FURNACE for case hardening of small metal wheels, reduced rejects and operating delays.

which it can be transmitted—Heat by conduction requires a solid for transmission. Heat by convection requires a liquid, air or other gaseous atmosphere for transmission. Heat by radiation is delivered directly from the energy source to the intended work in radiant form and requires neither solid, liquid nor gas for transmission. Applications resolve themselves into three general classifications, namely, evaporation of water and solvents, drying of paint and surface finishes, and increasing temperatures of materials to facilitate manufacturing processes.

Infra-red lamps are the latest form of supplying heat for industrial purposes. There is no absolute rule for application and installation. Two applications which may appear to require the same time and temperature treatments may need entirely different treatments. Despite the obvious advantages of infra-red lamps, each job still requires special engineering and it is important, therefore, to check with the manufacturers to avoid possible pitfalls.

Electric steam generators are increasing in use and are an economical investment. The main advantage is that they can be installed near the operated machine and supply steam when, as, and where needed.

An example is cited of an installation of four units that reduced operating costs of heating the molds of large steam-jacketed hydraulic Bakelite presses. By an investment of \$800, a saving of over \$2,000 was realized. Formerly steam was supplied by a large, remotely located oil-fired boiler. This boiler required constant attendance, and had to be operated even though only one press was in use.

The individual electric steam boilers were installed adjacent to each press and now steam is supplied only when needed. No attendant or attention is required. The boilers are automatic and protected by low-water cut offs. Operation also demonstrated an advan-

tage not originally conceived—mechanical qualities of the molded Bakelite were improved because of the more uniform temperatures.

Electrically heated ovens are used primarily for baking and drying. Often in curing small molded parts, definite, predetermined temperature cycles, are required which do not vary more than 5 percent. If the variation is too great, the products will be brittle or soft.

The electric heaters can be placed near the top of the oven, so there can be no direct radiation to the work being cured. By the use of "cross-flow" recirculation, an even temperature is maintained in the oven. A motor-driven fan forces heated air downward through a louvered duct in the center of the oven which extends from the top to the bottom. The air is circulated about the molded parts, passes to the sides of the oven, and then returns to the top for recirculation. If explosive vapors are given off by the work, sufficient fresh air must be provided for proper dilution of the oven atmosphere.

Small heating units are used for localized heating. The three general types are: (1) cartridge units which are inserted with a sliding fit in the part to be heated; (2) strip heaters which are placed usually between two sections of the part and in good contact, or clamped to the outside of containers; and (3) immersion units which have the heated section immersed directly in the liquid.

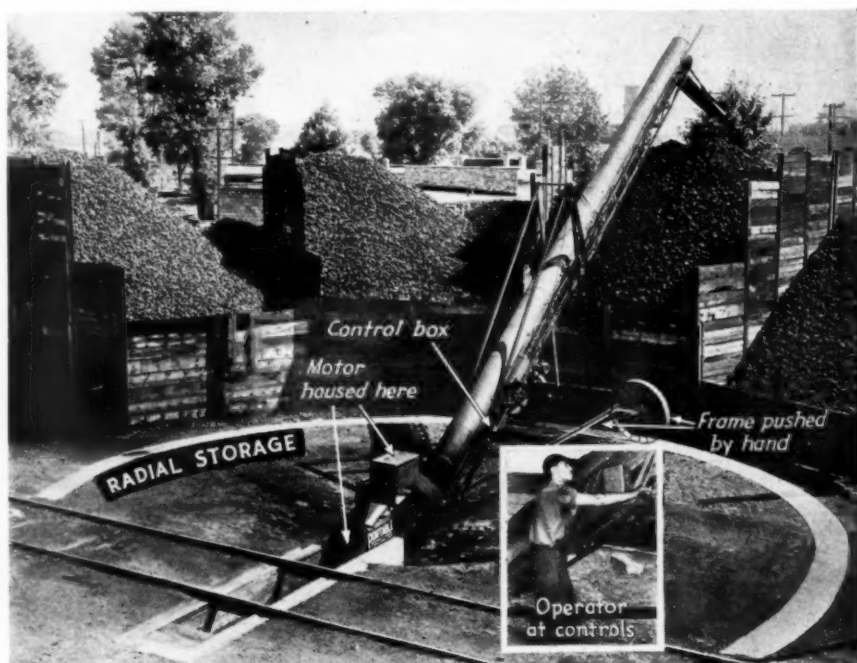
By using three 5-kw. immersion heat-

ers thermostatically controlled in a melting pot, 2,000 lb. of lead for backing electrotype shells is maintained at 650 F., for example. With this installation, the Art Engraving Co., Reading, Pa., reports that the lead is kept at exact casting temperature which insures better work, improved working conditions and reduced dross. In addition, the average power factor of the plant was increased from 79 to 91 per cent by utilization of electric heat.

To determine the energy and power requirements of small heating units to heat a given substance, formulas, curves, and other examples are given in the Maintenance Guide Sheet. This material has been furnished by General Electric and Westinghouse.

Portable and semi-portable electric heating devices for specific applications have come into use since the advent of small heating units, and thereby brought reduction in unit costs. Some of the devices are: soldering irons, glue pots, hot plates, compound-melting pots, metal-melting pots, branding irons, kettles, industrial air heaters, and electric unit heaters.

Unit heaters of the forced-convection type may use electricity, steam, hot water, or gas in combination with a motor-driven fan. They are most of them thermostatically operated. They are used for space heating and can be mounted at strategic points. When furnished with adjustable louvers or deflectors, they direct the heated air at a suitable angle for the area. This method of space heating has proved



PORTABLE CONVEYOR, with 5-hp. motor, receives coal from belt conveyor in track hopper and discharges in radial bin. This enables one man to unload 50-ton car load of coal in less than one hour.

MAINTENANCE GUIDE SHEET

ELECTRIC HEATING—CALCULATING POWER REQUIREMENTS

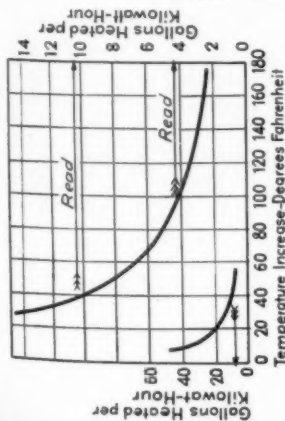


Fig. 1—Water heating. Curve based on 100% efficiency.

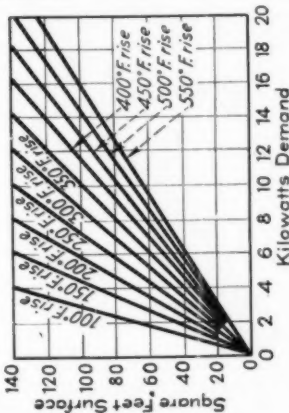


Fig. 2—Heat losses through insulated walls, such as ovens and pipes. Curves based on insulation 1 in. thick of standard high-grade material, such as 85% magnesite, Rock-Fillinsul, etc. If insulation is 2 in. thick, divide curve values by 2; if 4 in. thick, divide by 4; etc.

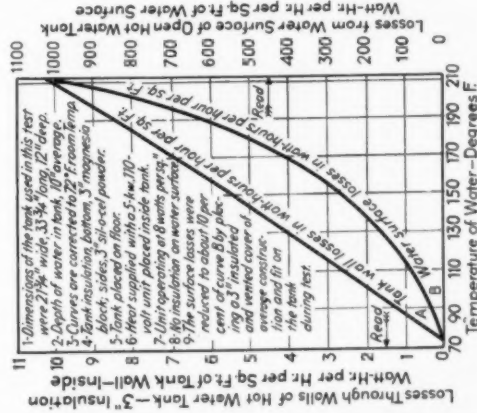


Fig. 3—Heat losses from open hot-water tank.

CURVES, formulae, data and examples given below will be helpful in determining the energy required to maintain the proper temperature in a given part or substance. Exact power requirements are difficult to determine because of many varied conditions. Consequently, the unit or units chosen should have ample capacity because the rating can be more easily reduced than increased.

To determine the energy required to heat a given substance, the total of the individual requirements must be calculated and added. Heat absorption of the substance, of racks or trays, or of ventilating air, and heat losses through walls, doors, exposed surfaces, must be considered.

CALCULATION—The energy, E , in Btu required to heat any substance may be calculated by the formula:

$$E = W \times \text{Sp. Ht.} \times T$$

where W = weight of the substance in pounds; Sp. Ht. = specific heat of substance; and T = temperature rise in degrees F. Electric energy in Kwhr. = Btu $\div 3412$.

$\div 1 \text{ hr.} = 1 \text{ kw.}$, plus losses.

RESULT: The installation should consist of one 10 kw., 3-heat water immersion unit and a suitable thermostat.

CHECKING:

$$E = \frac{W \times \text{Sp. Ht.} \times T}{3412} \times \text{hours for heat-up}$$

$$= \frac{562 \times 1 \times 100}{3412 \times 2}$$

$$= \text{approximately } 8.25 \text{ kw.}$$

(B) EXAMPLE FOR OVEN BAKING

GIVEN: An oven having inside clearances of 3 ft. deep by 2 ft. wide by 3 ft. high, with 2-in. insulated walls.

REQUIRED: To bake 150 lb. of steel parts per charge to a temperature of 250 F.

FACTORS: Weight of trays used, 50 lb. Time of bake, 45 min. Ventilation required, 4 changes per charge. Initial temperature of steel and air, 70 F. Average specific heat of steel, 0.12, and of air, 0.237.

SOLUTION: Summation of the heat requirements are: For $(150 + 50) = 200$ lb. of steel, heated from 70 to 250 F.

$$\text{Energy to heat steel} = 200 \times 0.12 (250 - 70) = 1.27 \text{ kwhr.}$$

$$4 \text{ changes of air} = 4 \times 2 \times 3 \times 3 = 72 \text{ cu.ft. per charge.}$$

$$\text{Weight of air} = 72 \times 0.08 \text{ lb. per cu. ft.} = 5.76 \text{ lb.}$$

$$\text{Energy to heat air} = 5.76 \times 0.237 (250 - 70) = 0.072 \text{ kwhr.}$$

$$\text{Total energy} = 1.27 + 0.072 = 1.34 \text{ kwhr. needed in 45 min. (0.75 hr.).}$$

$$\text{Power to be installed} = 1.34 \div 0.75 = 1.8 \text{ kw., plus losses.}$$

Losses from the walls, door cracks, etc. (Fig. 2) = 2.9 kwhr. per hr. for 53.3 sq. ft. (taking 0.1 of the loss for 533 sq. ft.) with a 1-in. wall. For 2-in. wall, divide by 2,

which gives 1.45 kw, plus 15% for extra door loss = 1.67 kw.

RESULT: Total power requirement = 1.8 kw. plus 1.67 kw. plus approximately 25% for controlling and contingencies = 4.5 kw.

(C) EXAMPLE FOR LEAD MELTING

GIVEN: A pot having inside dimensions of 12 in. diameter, by 9 in. deep, with a holding capacity of approximately 425 lb. of lead.

REQUIRED: To melt 300 lb. of lead per hr. and heat it to 750 F.

FACTORS: Lead at 70 F when charged; average specific heat of solid lead = 0.12, of melted lead = 0.04; heat of fusion of solid lead = 10 Btu per lb.; melting point of lead, 621 deg. F.

SOLUTION: Energy to melt the lead

$$\text{Kwhr.} = \frac{W \times \text{Sp. Ht.} \times T}{3412}$$

$$+ \frac{Hf \times W}{3412}$$

$$= \frac{300 \times 0.031 (621 - 70)}{3412} + \frac{10 \times 300}{3412}$$

$$= 24 \text{ kwhr.}$$

Energy required to raise the temperature from 621 to 750 F

$$\text{Kwhr.} = \frac{300 \times 0.04 (750 - 621)}{3412}$$

$$= 0.45 \text{ kwhr.}$$

Energy required for melting and raising temperature = $2.40 + 0.45 = 2.85 \text{ kwhr.}$ plus losses. Heat losses from this pot are 1.56 kwhr. per hr. at 750 F (Fig. 4). Maximum losses will be taken, but the bath will be at 750 F only a small part of the time. Therefore, there will be required $2.85 + 1.56 = 4.4 \text{ kw.}$

RESULT: The pot should have a rating slightly higher than the actual requirements, or approximately 5 kw.

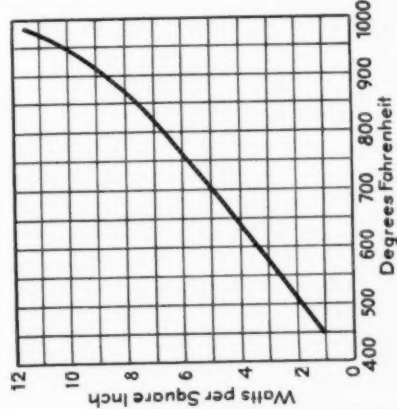
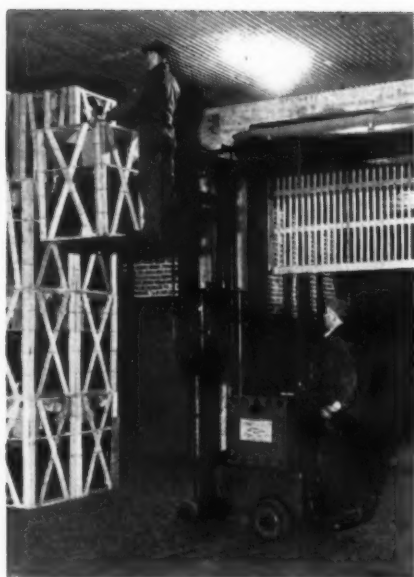


Fig. 4—Heat losses from molten-metal surfaces, such as babbitt, lead, tin, and type metal.



ELECTRIC LIFT TRUCK tiers 325-lb. stoves. Handling time is 7.5 man-hours per 100 units, a reduction of 50 per cent.

economical in heating cost. In one concrete building, with 277,000 sq.ft. of floor area, an installation of 40 unit heaters (steam) and zone control reduced heating fuel costs from $3\frac{1}{4}$ to $2\frac{1}{4}$ cents per sq.ft. In addition, production was increased, because a uniform temperature speeds drying in the paint shops.

Arc furnaces, induction furnaces, and resistor-type furnaces are used to change the structure of metals for working. An important advantage here is the economy effected in providing a uniform product. Also, depending on the kind of furnace, scrap material can be salvaged, melting losses can be reduced, small orders can be handled quicker, and parts can be duplicated at any time.

2. Motor and Control

Although motors may be used extensively in the plant, opportunities for better applications of this class of equipment may be overlooked easily when operations are being studied for the purpose of reducing costs. A little ingenuity with a motor drive may solve the problem. Production and other operations performed manually often can be done in less time, even though the motor requirement may be as small as $1/20$ hp. In some cases torque or speed will be the governing factor rather than horsepower.

Reduction in cost can be made also by changing the method of drive. A good example is an installation of two motor-driven centrifugal pumps, automatically operated, replacing steam pumps. When the steam pumps were used average water consumption during

24-hr. periods was 100,000 gal. Operation required two men. But when the change-over was made, the original tank was retained and the two 15-hp. motors on the 140 gpm pumps were started and stopped by float switches. Although the water consumption has been doubled, the cost of operation is only \$705 and the saving is \$2,850 annually.

Suitable control equipment is required if the motor and machine are to be operated as desired. A push-button, a relay, a solenoid, or a limit switch may be the solution. A small control device may soon pay for itself, if it prevents interruptions of operations, idle man-hours, and possibly removal of material from machines before operation can be resumed. Such a device might be a time-delay relay which would permit the main contactor to remain closed during a line-voltage dip that does not exceed four seconds.

Another small control device is the mercury contact tube which when tilted makes and breaks a circuit. This device was used recently by a manufacturer of wax paper to stop buckling of paper in a printing operation and eliminate wastage. The mercury contact tube was attached to a lever resting on the sheet of paper. When the paper broke the tube changed position, opened a relay control circuit, and stopped the press motor.

3. Material Handling Equipment

Conveyors, hoists, cranes, electric trucks, and similar equipment, all motor driven, can be used advantageously to reduce costs of manual material handling. A conveyor between two machines or work benches may facilitate movement of finished or semi-finished light weight parts.

Portable conveyors provide for flexibility; discharging material within a specific radius and elevation, or conveying material for an extended distance by the use of two or more conveyors.

One installation of such a portable conveyor enabled one man to unload a 50-ton car of coal and stack it in less than 1 hr. The conveyor is driven by a 5-hp. motor. It swings at the base, can be raised or lowered at the discharge end, and serves a semi-circle of bins with capacities up to 8,000 tons. A belt-type conveyor, powered by a 3-hp. motor, carries the coal from a track hopper to the portable conveyor.

Platform trucks facilitate handling and tiering of material. A mid-west stove manufacturer for instance, was able to reduce handling time when tiering a crated product, weighing 325 lb. four high. The time is 7.5 man-hours per 100 units, at a 50 percent reduction.

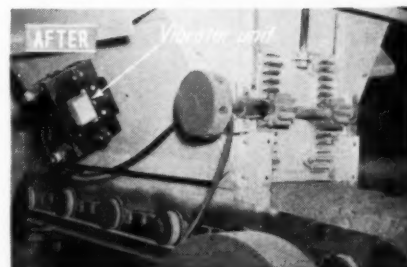
4. Special Equipment

In addition to the equipment ordinarily thought of and used, other or special electric equipment often can be employed to reduce costs. A few such items and applications might be—

An electric vibrator is suitable for maintaining a steady flow of material from a hopper. The unit can be adjusted for the number of vibrations per minute and attached to a side of a hopper. An installation of a vibrator was made at the plant of The Lone Star Cement Co., Houston, where fine, damp sand clogged the discharge hopper on an apron conveyor.

An automatic soldering iron for soldering terminals to ignition cables in another case increased production 500 percent. It employs a small arc of low voltage and comparatively high current. The machine can be plugged into a 110-volt a.c. convenience outlet. It is rated 150 watts but consumes an average of only 75 watt-hours per hour. Formerly the operation was performed with a hand soldering iron and the output averaged 25 per hour.

Dust is a problem in every plant and arrangements must be made to dispose of it. Some cleaning operations require considerable time and are costly. Some dust has a salvage value. An installation of *electrostatic dust precipitators* in a chinaware plant cut the cleaning time to one-tenth, and resulted in economy of space over that required by the settling chambers formerly used. In addition 4 tons of china glaze are recaptured each week. Since each pound of salvaged material may be worth as much as \$2, the annual "pay load" runs into sizable figures.



ELECTRIC VIBRATOR attached to side of hopper maintains a uniform flow of sand at this cement plant.

FEATURING



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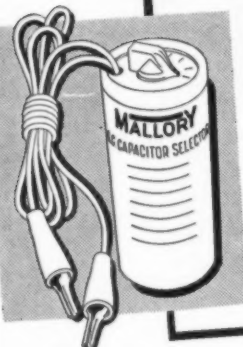
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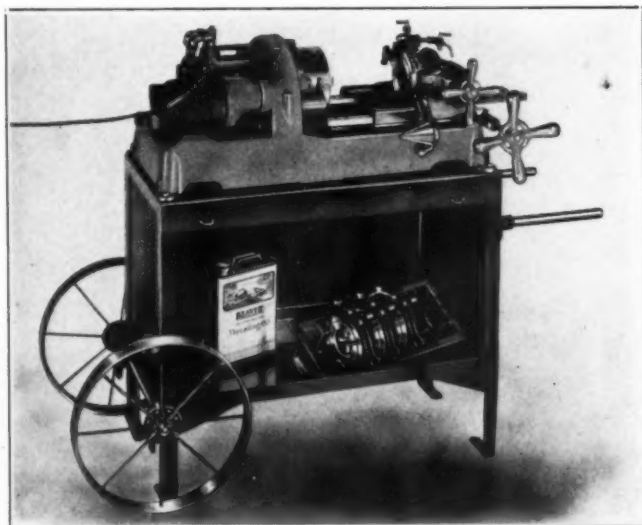
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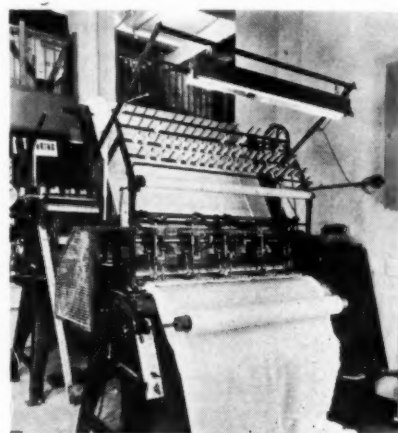
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Fluorescent Lighting Detects Broken Threads

Operators of quilting machines are often required to watch as many as 30 threads at one time and detect a broken thread immediately. To help in this operation fluorescent lighting units were installed and provide a light intensity of 30-foot-candles at the needles. The lighting proved to be an important operating advantage for a quilt manufacturer in New York.

Above each of 30 machines there is mounted an industrial-type reflector



FLUORESCENT LIGHTING, providing 30 foot-candles at needles of quilting machine, permits immediate detection of a broken thread while the operator is watching as many as 30 needles at one time.

housing a 36-in. 30-watt "daylight fluorescent Mazda lamp and the necessary auxiliaries. The lighting units plug into separate 220-volt a-c outlets, and are spring-supported at each end to absorb vibration pick-up from the machines. The installation was made by the industrial division of the Maintenance Co. of New York City.

Glow Lamp Applications

At a material saving in cost of both current and maintenance, glow lamps can be used for numerous purposes. Some uses are:

Test light—to determine polarity, frequency, and power (a.c. or d.c.) of a circuit.

High-voltage indicator—to indicate when lines are "hot"; capacitively coupled to high-tension circuits.

Stroboscopic light—to measure slip of a motor shaft, from a chalk motor on end of rotating shaft.

Panelboard indicator—to indicate when panel is "hot"; as a safety precaution.

Exit light—to serve as exit light or marker; red-sprayed lamp available.

Convenience outlet indicator—to indicate when outlet or extension cord is energized.

Fire-alarm station marker—to mark location of fire alarm box.

Connection cord indicator—to indicate when device such as soldering iron or glue pot is consuming power; convenient to have included in plug receptacle on cord or elsewhere in cord circuit.

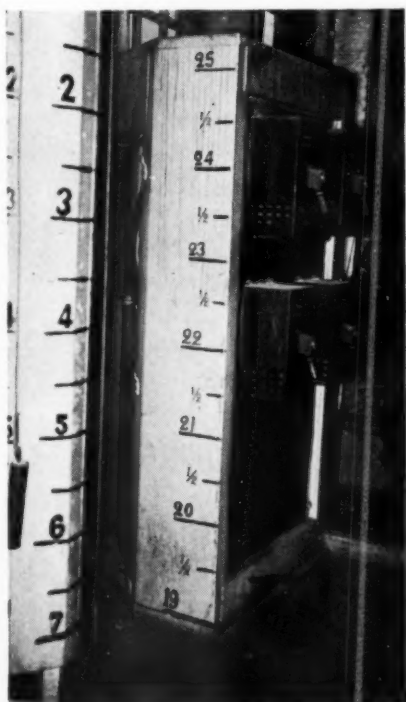
Clear lamps are available in 8 sizes ranging from 1/25 to 3 watts; red-sprayed lamps in 2- and 3-watt sizes. Both types are designed to operate on commercial lighting circuits of 105 to 125 volts.

Centralized Control Aids Maintenance

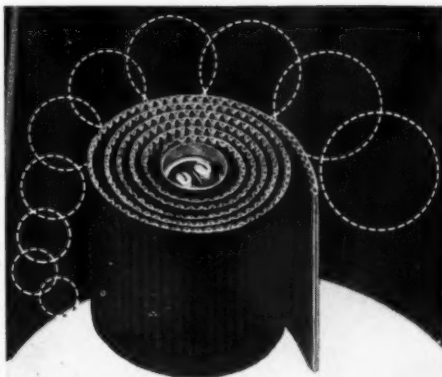
Grouping of air circuit breakers is one method by which the chief electrician of a Philadelphia sugar refinery was able to lower maintenance costs. Different types of installations are required in different sections of the plant. Direct current is used for purposes of obtaining variable speed.

One type of installation is a cabinet employed for the panel-mounted breakers in the crystalizing room. Each breaker serves a branch feeder for a group of motors. The back of the cabinet is accessible through a door at the side, for inspection of the feeders.

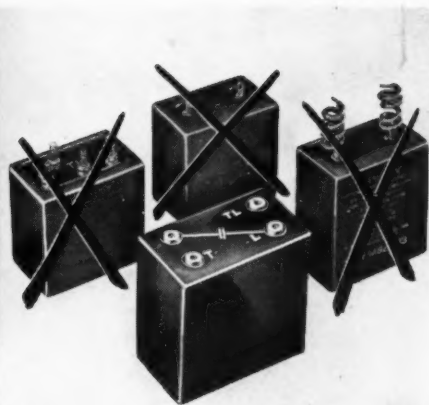
In the centrifuge room, as in other



CENTRALIZED CONTROL—Four 400-amp., 250-volt circuit breakers serve individual branch feeders for a group of motors. Door at far side permits access to back of cabinet for feeder inspection. Calibrations on cabinet are for sweet water reservoir gages nearby.



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Tubes engineers had two objectives in mind — to provide the protection of steel for wiring at low cost and to make work easier for the electrician.

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Then there's the new ELECTRUNIT Bender

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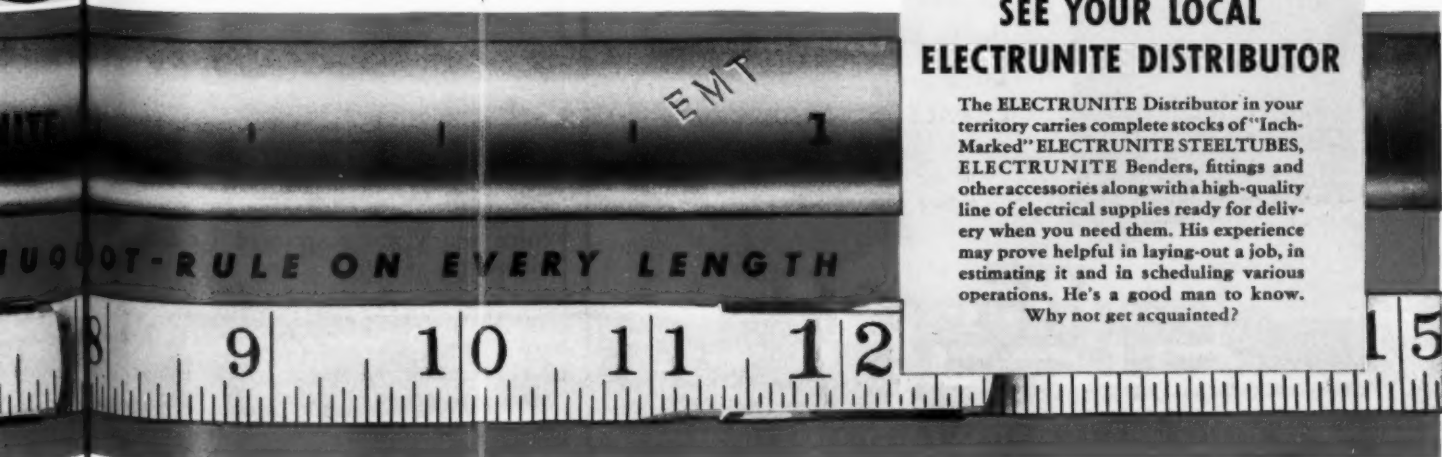
Try "Inch-Marked" ELECTRUNIT STEELTUBES on your next job — exposed, concealed or in concrete. See for yourself how easy it is to handle — and you'll want to use it on every job. Steel and Tubes Division, Republic Steel Corporation, Cleveland, Ohio.

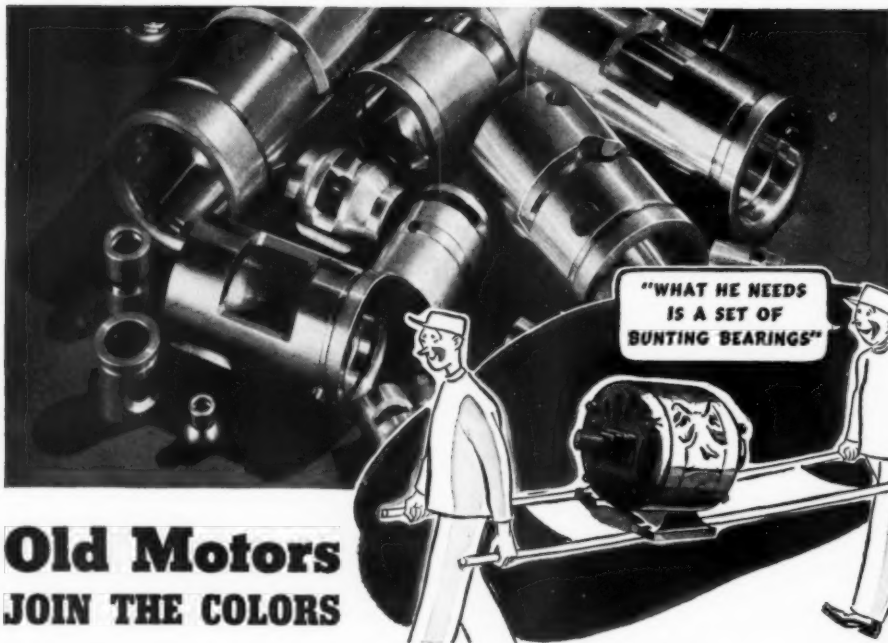


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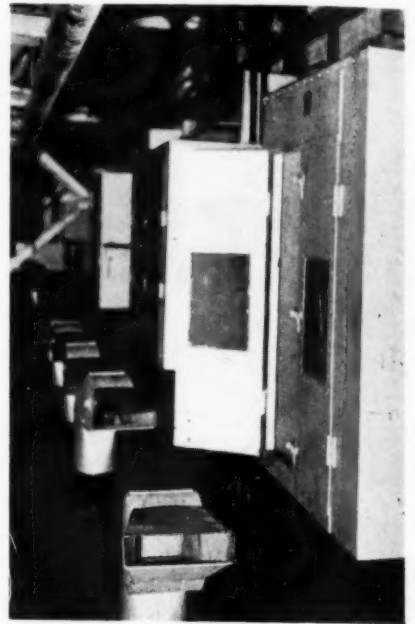
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parts of the plant where dust and moisture are prevalent, additional protection is necessary for the circuit breakers. Both live-front and dead-front breakers are used, and both types are enclosed in steel cabinets. Glass doors permit observation of the breakers from the aisle, without opening the cabinet doors. The steel cabinets have prolonged the life of the breakers and are



OTHER GROUPS of circuit breakers are enclosed in steel cabinets where dust and moisture are prevalent. Glassed-in door permits observation.

economical for this plan where four or more breakers can be grouped at one location.

A sub-distribution center is one of the largest groups of breakers in the plant. The group includes the following ratings; four of 400 amp., six of 200 amp., and three of 150 amp. Because the breakers are located along the main aisle, they are protected by a guard rail.

Convert Drive For Bolt Cutter

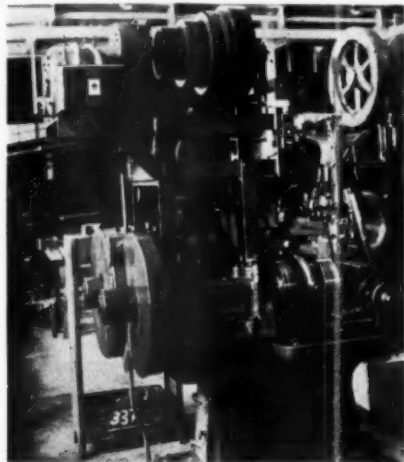
A New England firm when moving from an old plant to a new shop salvaged about 50 machine tools which were belt-driven in groups. These machines were in good enough condition to operate for an indefinite period.

Among the number was a National duplex bolt cutter and threading machine which was rearranged for individual motor drive. The step-pulley main drive was retained. The former line shaft connection was replaced by a second step-pulley and a 7½-hp., 550-volt, 3-phase induction motor. This equipment was mounted above the machine, on a special welded frame.

The frame was fabricated of ½" by

3-in. strap-iron, with a maximum length of 45 inches, the motor being carried about 30 inches above the machine. The frame was bolted to the machine bearing housing and an idler pulley was provided to carry the 3½-in. drive belt between the pulley sets.

An across-the-line starter was mounted on a side of the motor and a single conduit riser from the floor fed the unit. A push-button was located



INDIVIDUAL MOTOR DRIVE and starter supported by a welded frame on a bolt cutter.

centrally above the machine, being served by a single horizontal run of conduit from the starter.

The resulting arrangement for individual drive compared favorably with other equipment in the new shop, from the standpoint of freedom, from obstruction of work, safety, and space and operating economy.

Additional Light for Enlarging Photographs

For the maintenance man who is interested in photography. A "three-lite" photo enlarger lamp makes enlarging easier by accommodating the increasing variety of printing papers and negative sizes with which photographers work.

The lamp has two filaments, is rated 50-100-150 watts, and is about the size of a conventional 50-watt bulb. Various settings of a switch turn on either or both filaments. Thus additional light can be obtained as needed, in much the same way as three-way floor or table lamps operate.

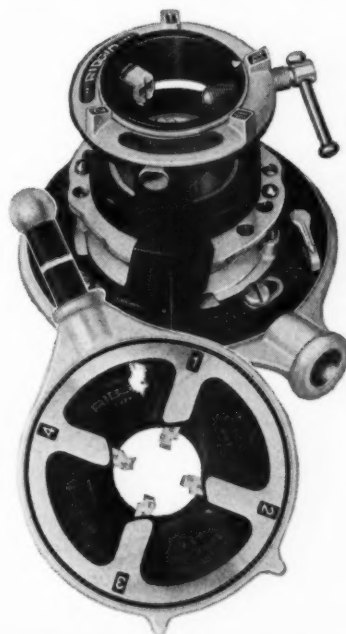
Average life of each filament is 100 hours. This Westinghouse lamp can be used in any position.

A special socket is required for the three-contact medium screw base. Since external size of the socket is the same, however, it may replace the conventional type of socket.

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RIGGID

WORK-SAVING PIPE TOOLS

Reader's QUIZ

QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repair. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published, we pay \$5.00.

PHASE READINGS

QUESTION 4. *On a 2300 volt distribution panel we do not get balanced ammeter readings on the three-phases. With the ammeter selector switch in position 1, an average reading is 56 amperes, in position 2, it is 92 amperes, and in position 3, it is 56 amperes. Checking with a tong type ammeter, we find the current to be 56 amperes on each leg. The wiring has been checked completely and thoroughly but the cause of the discrepancy in readings has not been found. Can somebody tell me why?—R.C.M.*

A. TO QUESTION 4. This would seem to indicate that the ammeter was connected into the common lead on this position of the switch, although R.C.M. says the wiring has been carefully checked. This can happen and gives a wrong reading unless the ammeter is compensated to take care of this condition. It would seem it is not, as it reads correctly on the other positions and with the tong test. I would check the wiring again with this in mind, and possibly it will show up.—W.G.C.

A. TO QUESTION 4. Your unbalanced ammeter reading is apparently due to a reversed connection of the wires, of one of your current-transformer secondaries, if they have been properly mounted in respect to their polarity markings. Thus reverse the instantaneous polarity of one of the transformer with respect to the other.

With the above connection, and the ammeter selector switch in position 1,

an average reading of 56 amperes is correct for the current in switch in position 3., regardless of the polarity of the current-transformers. But with the selector switch in position 2., the ammeter reading 92 amperes, indicates a reversed connection or reversed polarity of one of the current-transformers in respect to the other. Such a connection of the secondary causes a phase-angle displacement from normal, and thus an unbalanced ammeter reading.

Reverse the connecting wires of the secondary, of one of the current-transformers. This should correct your polarity difficulty, and you should obtain practically the same ammeter reading at each position of the selector switch. I have assumed a three-wire, three-phase system, using two current-transformers.—L.H.M.

CAPACITOR LOCATION

QUESTION 5. *In placing capacitors for power factor correction where is it best to put them in the line? Near transformers or halfway down to load or nearest to the load?—S.C.*

A. TO QUESTION 5. To properly place capacitors in a system for power factor correction, depends upon the load conditions, the diversity factor of the load, and the arrangement of the feeders and distribution system of the plant. However, the capacitor will eliminate the wattless current in the circuit between the capacitor and its source. So generally speaking, it is best to place the capacitor nearest the load. For example, a capacitor of proper size or capacity, may be connected directly to the motor leads of

a motor to correct the power factor of the motor, and that portion of the line feeding it, while the motor is operating.—L.H.M.

A. TO QUESTION 5. The location of capacitors for power factor correction is governed by so many factors that it would be hard to answer S.C. without knowing his particular conditions. However, generally it is best to locate capacitors near the load because their corrective action is back toward the generator, or power supply. So by locating them near the load, the feeders, transformers, etc., are benefited by the increased carrying capacity and the reduced heating of the conductors.—W.G.C.

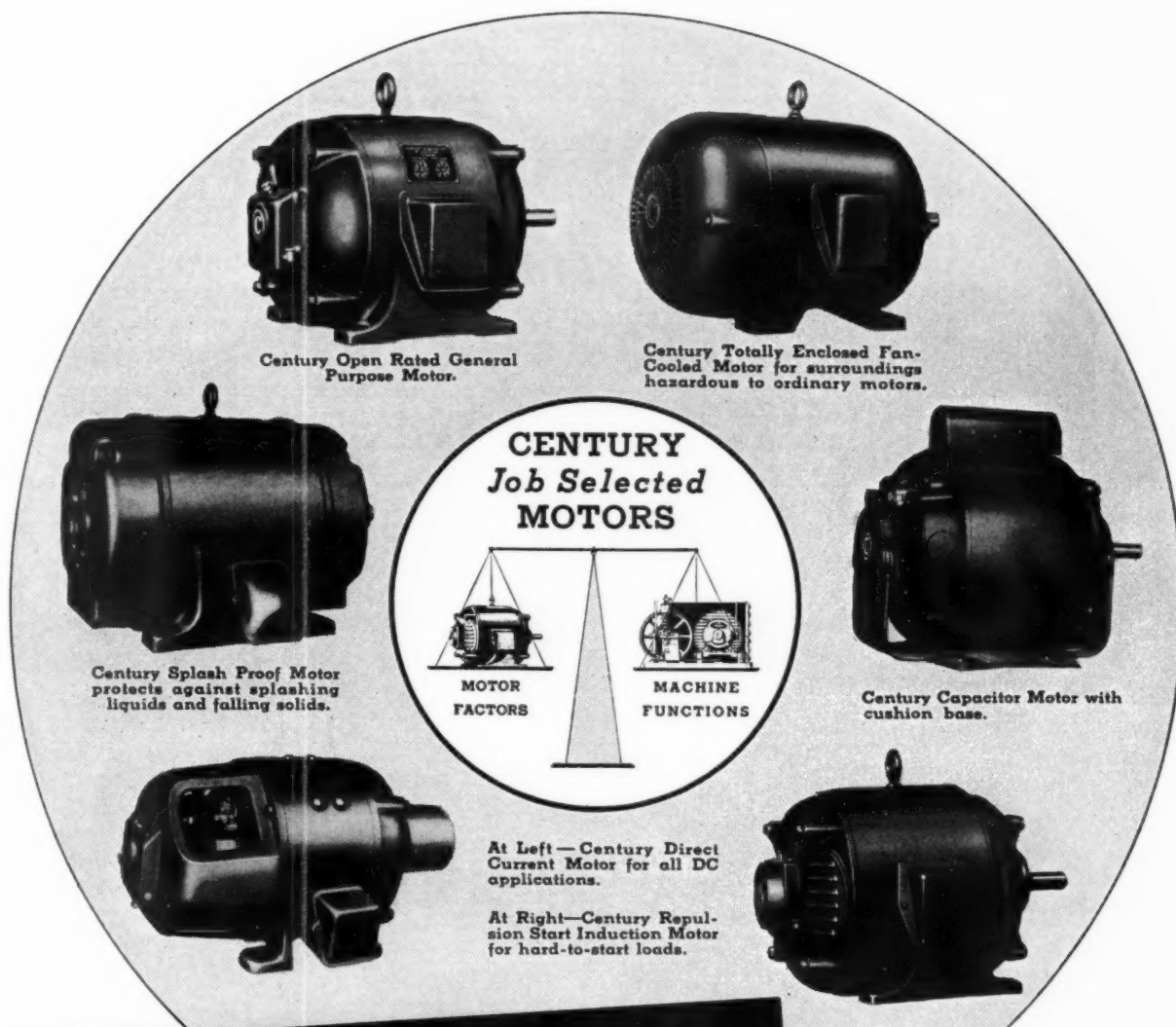
NEON SIGNAL

QUESTION 6. *We have signal lights on some of our machinery with a 110-volt a.c. switch connected on the ground wire inside the 440 volt motor starters. They burn when the motors are running. One of the lights is connected to a 110-volt motor that feeds carbon black to the 440-volt pulverizer and cannot be started unless the pulverizer is running. When the pulverizer and feeder motor are disconnected, the neon glow lamp signal will give a flickering glow. How can I stop that?—H.D.M.*

A. TO QUESTION 6. With your present connection your neon-lamp glow is due to either capacity or a high-resistance ground between the motor windings and the frame of the motor, which is usually grounded. It requires only a very small current to cause a neon-lamp to glow. This glowing may be stopped by using the interlocking switch to open the hot line of the 110-volt line, or the line that is above ground potential, to which the neon-lamp is connected instead of opening the grounded side of the line.—L.H.M.

A. TO QUESTION 6. The two words "carbon black" indicate the trouble to me. It wouldn't take much of this dust to furnish current for a neon lamp. If this cannot be eliminated use a small carbon filament pilot lamp, which will not operate on leakage.—A.F.L.

A. TO QUESTION 6. I suggest that the neon glow lamp be replaced by a 10 watt filament lamp. My experience with neon glow lamps is that they are very sensitive.



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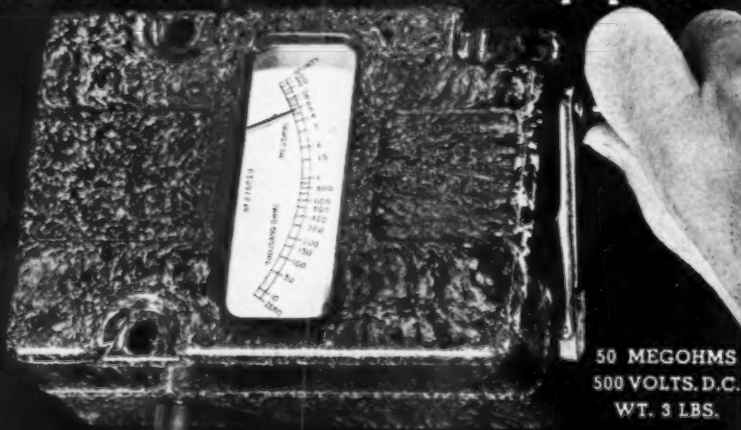
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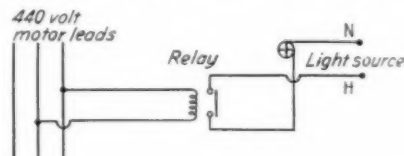
1211-13 ARCH STREET PHILADELPHIA, PA.

Reader's QUIZ

[FROM PAGE 68]

Short leads must be used and kept well away from other wires carrying electric current.—C.L.B.

A. TO QUESTION 6. The easiest way is to connect the hot wire to the switch instead of the lamp. Or use a relay switch in the motor



leads of 440 volt motor as shown above.—F.T.

PORTABLE CONTROL

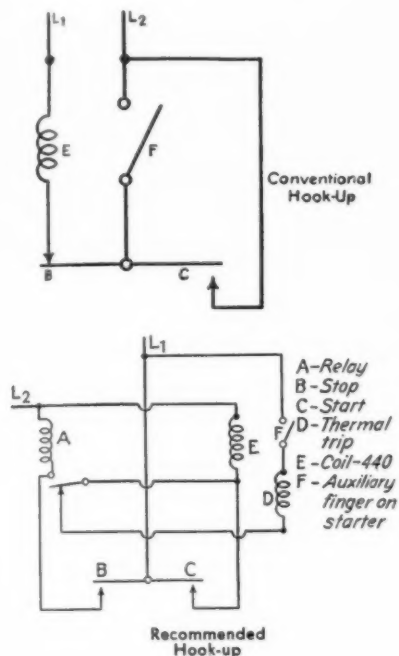
Q UESTION 7. We want to control a magnetic starter from any one of several locations by means of a portable plug on a cord with a push button. Is there a type of four pole plug and receptacle available that will allow the push button to operate while plugged in and yet close the stop circuit when the plug is removed so as not to interfere with operation from other locations?—D.H.B.

A. TO QUESTION 7. This may be accomplished with any standard 4-pole polarized outlet and plug. Connect push button station to plug. Trace out control circuit to the first outlet. Extend to as many outlets as desired, connecting like poles together on the added outlets.—R.E.H.

A. TO QUESTION 7. Can you not use a simple a.c. line starter controller which requires a 3-wire push button station? Then any 3-pole polarity receptacle would do. Then they could be connected in parallel and the stop circuit would be closed in the portable push button station.—J.B.C.

A. TO QUESTION 7. Unless it is desired to operate this arrangement in connection with permanently connected buttons, I can see no necessity for the four-pole plug arranged to close the stop circuit. The several receptacles may be connected in multiple on the three control wires and will operate from any place it is plugged in. Of course, if more than one station is wanted to be connected at one time this would not work.—W.G.C.

A. TO QUESTION 7. You cannot find a suitable plug at the 600 volt rating. But by making both start and stop buttons "make" and



adding a small, low priced normally "closed" relay, this circuit will meet the requirements for any number of stations. A regular 3-pole locking or polarized plug will then be O.K. Connect as shown above.—A.F.L.

WELDER VOLTAGE

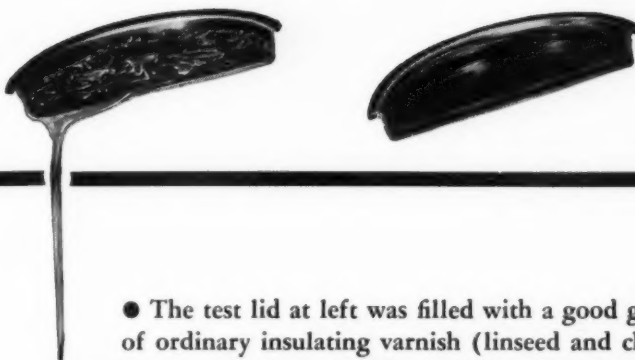
QUESTION 8. Our welder sets his machine on 60 volts and welds for a short time and soon the voltmeter reads 57 or 56 volts without being changed. How can I remedy this? What is the cause?—H.D.M.

A. TO QUESTION 8. The generation of heat in winding and rheostats causing loss of conductivity in conductors will cause drop in voltage. Keep all contacts clean, brushes in good shape and stabilizer free from dust and dirt and you will help to reduce voltage drop.—F.T.

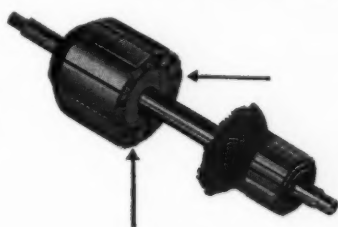
A. TO QUESTION 8. The cause of the voltage drop in your welding machine after a short running period is due to the machine warming up, or temperature rise in the windings. As the temperature of the windings increases, the resistance of a given winding increases, thus lowering output voltage respectively. Thus, the voltage drop is equal to amperes times resistance times coefficient of the resistance of copper due to the temperature rise.

If this machine should have its field coils separately excited from an auxi-

TWO LIDS THAT TEACH A LESSON



● The test lid at left was filled with a good grade of ordinary insulating varnish (linseed and china-wood oil base), the test lid at right with HARVEL 612-C, the sensational phenol-aldehyde synthetic resin base insulating varnish made from Cashew Nut Shell Liquid. The lid with ordinary varnish was baked for two weeks at 220°F, but the lid with HARVEL 612-C varnish was only baked for sixteen hours. Then they were each cut in half—and look at what happened! The Lesson: HARVEL 612-C, curing by polymerization, is not dependent upon "oxidation" but sets completely dry throughout irrespective of the thickness of its application. Ordinary varnishes, which dry mainly by "oxidation," set on the surface but usually leave the interior wet or tacky. Thus, HARVEL 612-C gives better protection, especially in deep windings as in the armature shown below, and can be applied far more rapidly in multiple coats by allowing merely a brief bake between dips and a single final bake of the completely treated winding.



HARVEL 612-C cannot soften or throw out and when cured, it is neither affected by acids, nor disintegrated by mild or concentrated alkali solutions. It is highly resistant to transformer and lubricating oil and maintains its insulating qualities at elevated temperatures far better than ordinary varnishes. It may be applied in any of the usual ways and because of its excellent dip-tank stability, there is no storage loss.

A new folder, outlining in detail the characteristics of HARVEL 612-C is yours for the asking. Write Dept. 96 for this folder or for consultation on your specific requirements.

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TRICO FUSE MFG. CO., Milwaukee, Wis.
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Reader's QUIZ

[FROM PAGE 71]

liary or exciter generator, this voltage drop may be partially but not wholly eliminated by allowing the machine to run idle for a short warm-up period, with increased excitation on the field coils, in order to raise the temperature of the coils to about normal operating temperature.—L.H.M.

Can You ANSWER these QUESTIONS?

QUESTION E—In a number of plants, a color code is used to identify air, steam and water pipes. Has a standard code been established? And what colors are used to identify conduit carrying primary or 2,400 volt feeders, 110, 220, and 440-volt a.c. circuits, 115, and 230-volt d.c. circuits, and low-voltage circuits for fire-alarms, signals and telephones?—R.M.S.

QUESTION F—On an ungrounded 110 volt, 2-wire, single-phase system I have several electric spot welders on rubber casters. Each one has a grounded wire run to the sprinkler system. Every once in a while the operators of a machine gets a shock. The fuses do not blow, but the machine becomes grounded. How could I remedy this trouble?—W.J.S.

QUESTION G—What is a good way to get rid of static from belts on machines mounted on a wooden floor without having to ground 200 or 300 machines?—S.C.

QUESTION H—We have a number of machines in a crane runway 50 by 100 feet. They were not provided with lighting because the building is of "all window" construction, and no night work was contemplated. The machines are lathes, planers and shapers, doing rough and semi-close work. The operators are unable to see close work on cloudy days.

We need overhead lighting with fixtures that will clear the traveling crane. But the management frowns on fixtures using more than 300 watts or too many lights burning. So we have run under-floor lines to some machines and provided flexible arm fixtures with 50 watt bulbs. The cords are tangled and broken. Bulbs disappear.

How can we properly illuminate these machines without making the meter spin? The clearance from floor to top of crane is 30 feet.—R.E.G.

PLEASE SEND IN YOUR ANSWERS BY JUNE 1



Easy to Install

- 1 Lots of Wiring Space**
- 2 Accessible Terminals**
- 3 No Concealed Wiring**
- 4 Plenty of Knockouts**
- 5 White Interior**



"There's so much room in that starter cabinet, he's using it for his proving ground!"

Roominess is a big feature of all Allen-Bradley Bulletin 709 starters. The white interiors make installation easier in dark locations. The convenient terminals speed up final connections. Cabinets have knockouts on four sides and back. Every practical electrician appreciates these unusual structural features.

After installation, Allen-Bradley solenoid starters are maintenance-free. The silver alloy, double break contacts need no filing, dressing, or cleaning. There are no pivots, pins, bearings, or jumpers to cause trouble. That's why the experienced maintenance men say—"Just install A-B starters . . . and forget 'em."



ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

QUALITY

The SIMPLEST Across-the-Line Starter

Therefore the
**MOST
DEPENDABLE**



Only One Moving Part

No Pivots • No Bearings • No Jumpers
No Concealed Wiring • No Maintenance

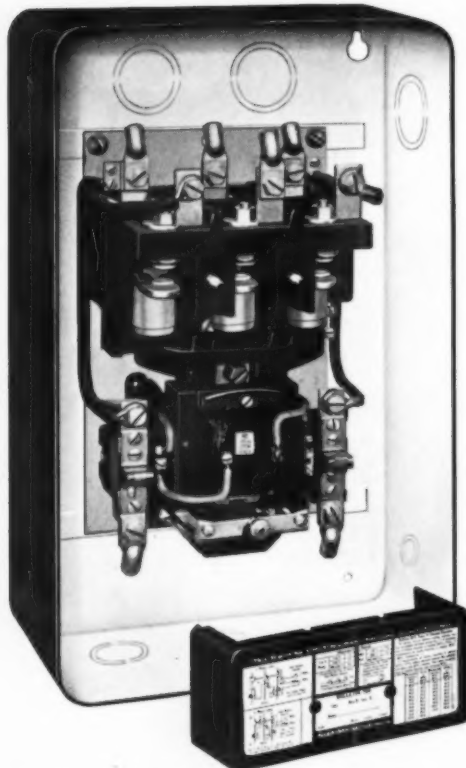
"The Simplest Starter" means fewer parts . . . and fewer parts mean fewer troubles.

In clapper switch starters, troubles are often caused by the sticking of bearings, the corrosion of pivots and pins, and other difficulties which interfere with reliable switch action. Even so-called "vertical" starters, which employ pivots and pins in their construction, are subject to the same troubles.

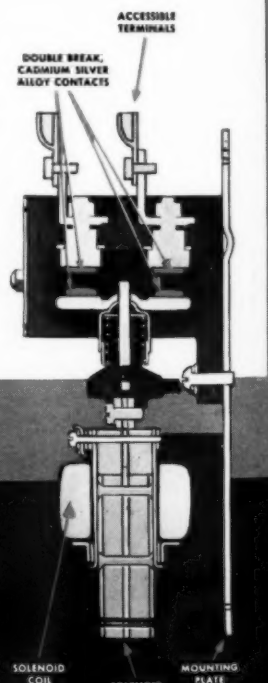
In Allen-Bradley solenoid starters, these troubles cannot occur. There are no bearings to stick . . . no pivots or pins to corrode . . . no flexible jumpers to break. There is only ONE moving part . . . the simple solenoid plunger!

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This is not boastful talk. We are ready to support these statements with testimonials and tests. If you are looking for the most dependable motor control, investigate the simplest . . . the Allen-Bradley Bulletin 709 solenoid starter. Allen-Bradley Co., 1307 S. First St., Milwaukee, Wis.



Open view of Allen-Bradley Bulletin 709 across-the-line starter with arc hood removed to show the sturdy, double break, silver alloy contacts that never need to be filed, cleaned, or dressed. Two accurate relays give reliable overload protection. Note also the roomy, white interior of the starter cabinet and the many knockouts which make installation easy.



ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

QUALITY

Lighting the National Airport

[FROM PAGE 21]

tact lights with blue filters, mounted in the taxi strips. They are visible only for a short distance and guide planes to and from runways and the terminal apron. Each separate section is on a separate control so the dispatcher can light a guiding path ahead of the taxiing plane.

Flush red and green marker lights are provided wherever a taxi strip meets a runway. These are visible only to a pilot taxiing on this strip. They are under control of the dispatcher and he can either release or hold a plane.

The wind indicators are of a design not used before in the United States. They are electrically operated smoke generators, which take the place of the standard wind tees, tetrahedrons, or wind cones. They are mounted flush with the ground at four intersections in the landing area and are so located that at least one will be illuminated by any bank of floodlights used. The units consist of an electrical heating element that vaporizes fuel oil which passes up in a steady stream of smoke. By observing the smoke, pilots determine the wind direction and approximate velocity at the field.

Lighting Control Board

The nerve center of the field lighting is centered in a three section control desk installed in the control tower on top of the administration building. The heart of the control system is in four switches on the desk, which control a total of 135 field circuits. All this is accomplished through pre-set circuits similar to theatre lighting.

The left and right sections of the board, respectively, contain instrument landing controls and switches for the continuously operated circuits and radio. The center section controls the landing and take-off lighting circuits. Here a miniature of the field is reproduced with translucent runways and pilot lights indicating all major field lighting units. The wind indicator has reverse compass readings to indicate the runway approach to be used rather than actual wind direction.

The four switches mentioned include a selector switch which is set to the runway shown by the wind indicator; two pre-set switches, normally set at sundown and turned off at dawn, to set up the master control switch for runway flood and contact circuits; and the master control switch which has "off", "take-off" and "landing" positions.

A fifth switch, for emergency use, changes all traffic signals to red.

The entire board is duplicated for stand-by purposes, with a double throw switch to throw the control on either board and prevent simultaneous operation of signals on two runways. All pilots on the board are fed from a special bus with a dimmer control. All operating handles, instrument needles and numbers are finished in fluorescent enamel so they will be visible in the light of concealed ultra-violet lamps, for operation in complete darkness. All pilot lights are carefully screened with louver glass to prevent reflection from the slanting control tower windows.

Maintenance and Methods

Ease of maintenance and operation are features of this installation. All controls are as simple and foolproof as possible. Underground distribution and control ducts have plenty of spare capacity. Empty ducts are provided for additional load of future parallel runways. Dual control groups on the main panel can readily be adapted to simultaneous operation of future parallel runways.

To simplify lamp maintenance and prevent unheralded burnouts, fourteen electrically operated elapsed time indicators are installed in the electrical equipment room of the terminal building. They are connected in the lighting control circuits to indicate the accumulated operating time of the floodlights, runway contact and boundary lights. When the rated life of the lamps are approached, they can be replaced before burning out.

In general, the methods used on this job were similar to those used for any underground distribution. Single duct lines are of NoCrete fibre duct, multiple lines of standard fibre duct encased in a transit-mixed concrete envelope. Trenches and backfill for the duct were dug by W.P.A. labor under the contractor's supervision. The 314 pre-cast concrete handholes, used for the contact lighting, were constructed in the field by the H. P. Foley Company.

To pull in some sixty-odd miles of lead covered cable, over an area of 556 acres, required four trucks with boom equipment and two reel trailers. The reels were raised to the trailers and taken to a feed-in manhole. The trailers were then unhooked and the truck driven to the pulling end of the duct. These trucks were also used to distribute the materials around the field.

An average crew of 20 electricians with two engineers took 120 days to complete this field lighting job. It cost approximately \$187,000 with equipment.

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Estimating

NEW MOTOR FEEDERS

The following cost study was made on a small job involving feeders and connections for two new motors in a one story factory building. The shop was in operation and work had to be installed with as little interference with normal operation as possible.

The job consisted of removing old cutout blocks from an existing panel, installing a new ten-circuit, three-phase panel, connecting to an existing feeder, running circuits for a 10 hp. and a 3 hp. motor along a center steel beam to the motors approximately 130 feet down the shop.

Installing 10-circuit three-phase distribution panel including several spare circuits. Connecting to adjacent feeder. Removing old cutout blocks from existing panels and reconnecting circuits.....18.00 m.h.

Wiring to 10 hp. motor including $\frac{3}{8}$ of time on 150 foot $1\frac{1}{4}$ -inch conduit run, 640 feet number 6 wire, flexible connection to motor and all wire connections....23.00 m.h.

Wiring to 3 hp. motor including $\frac{3}{8}$ of time on 150 foot $1\frac{1}{4}$ -inch conduit run, 780 feet number 12 wire, 40 feet $\frac{1}{2}$ -inch conduit and connection.....13.00 m.h.

The figures are for the complete work including lost time, superintendence, clean up, etc.

Data from Block Electric Co., Chicago, Ill.

UTILITY TABLE

The newest piece of equipment added to the air conditioned engineering department of E. C. Ernst, Inc., electrical contractors of Washington, D. C., is a large utility table.

The table-cabinet combination is 10-ft. long, 5-ft. wide and 30-inches high. It can be used by the draftsman, estimator and engineer simultaneously. The left end, shown in the accompanying photograph, contains a built-in illuminated drafting board with a 4-ft. by 3-ft. piece of clear plate glass covering the lighted area. Two 20-watt white fluorescent lamps provide the light at

present and provisions are made to use two more if necessary. A parallel rule device completes the equipment on the board. A portion of the 5-ft. end of the table is cut out to give easy access to the glass-topped board.

The area under the table top is divided into two sections. The one under the board has six 8-in. by 8-in. by 5-ft. pigeon holes on each side of the knee-hole opening. These are used to store prints of jobs that are being or have just been estimated. The knee-hole area contains hooks for brushes, triangles and other equipment as well as duplex convenience outlets for electrical erasing devices, tabulating machines or other electrical accessories. The right-hand section of the table contains six blueprint drawers, each 6-ft. wide and about 5-ft. long, to store working drawings of jobs in progress. The large table top area provides ample space for spreading plans for take-off or consultation purposes.

This table, designed by the Ernst engineers for their specific needs, is made entirely of wood and is the fourth 10-ft. working table in the room.



ENGINEER-ESTIMATOR H. E. Proctor of Hixon Electric Company, electrical engineers and contractors of Boston, Mass., has another feather added to his cap. He is on the home stretch of engineering the electrical installation at the new home of the New England Mutual Life Insurance Co., of that city.


BRANCH CIRCUIT DATA

The labor data in the accompanying table was compiled by Martin E. Keane, an independent electrical estimator of West Roxbury, Mass., from years of experience in electrical construction and at the former Electrical Estimating Bureau at Boston, Mass.

These units are now being used by Mr. Keane for new construction work and for electrical estimating classes which he teaches in and around the Boston area. The table is offered to you as a guide in estimating labor to install branch circuit conduit, outlets, wiring devices, wire; also cutting holes under various conditions encountered in building construction. (See page 78).



ILLUMINATED TRACING board is built into this large utility table in the engineering department of this Washington contractor. Fred G. Mitchell, engineer-treasurer of E. C. Ernst, Inc., finds tracing an easy job now.



IT BEATS ALL
THE WAY THE AIRPORTS
ARE SOCKING THEIR
CABLES UNDERGROUND
IN ORANGEBURG

THAT JUST
SHOWS
HOW
THE WIND IS BLOWING
IN MODERNIZATION

When you "modernize" underground distribution systems with Orangeburg Conduits, you modernize for today and tomorrow, for being essentially pitch, Orangeburg is essentially everlasting — provides permanent raceway facilities for the requirements of twenty, thirty or more years in the future.

And—there's no extra cost for Orangeburg's extra values. In fact, its cost is about half that of metal pipe—and because it handles easier and installs faster, there's extra profit in every foot for every contractor.

Sales Agent—Distributors

General Electric
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*There's extra profit for
you in every foot of*

ORANGEBURG Conduits

MADE AT ORANGEBURG, NEW YORK, BY THE FIBRE CONDUIT COMPANY, 292 MADISON AVENUE, NEW YORK CITY

ORANGEBURG

NOCRETE for installation without concrete encasement
STANDARD for installation with concrete encasement

G-E

TEXTOLITE SOCKETS GIVE LASTING SERVICE



You can use these sockets in literally hundreds of places—factories, homes, stores, etc. They are good looking to start with and will remain that way. Shells and Caps will not rust, corrode, flake or tarnish. • The threaded catch connection will hold the cap and shell together securely regardless of vibration in a factory or constant handling on a bridge lamp. All of these sockets have standard shadeholder threads which hold the shade securely without damage to the socket. • Caps and shells are insulated. There is no lining to char. The bodies are "sealed in." • Sockets are available in pull, push, key and keyless types. Caps may be threaded, pendant, or pendant with clamp grip. • For further information see your nearest Section Merchandise Distributor or write Section D185, Appliance and Merchandise Dept., General Electric Co., Bridgeport, Conn.

**STRONG
WHERE STRAIN
IS GREATEST**



LASTING FINISH

INSULATED CAP AND SHELL



RESISTS VIBRATION

GENERAL ELECTRIC

Estimating

[FROM PAGE 76]

LABOR DATA FOR BRANCH CIRCUIT WORK

BRANCH CIRCUIT CONDUIT

SIZE	HOURS PER HUNDRED FEET									HRS. EACH	
	A	B	C	D	E	F	G	H	I	Ells	Bends
3/4"	1.2	1.3	1.3	1.3	1.2	2.4	1.4	6.0	4.0		
1"	1.9	2.0	2.0	2.0	1.9	3.2	2.1	8.0	5.0		
1 1/4"	3.4	3.5	3.5	3.5	3.4	5.0	3.7	10.0	7.0	0.8	0.2
1 1/2"	4.3	4.3	4.3	4.3	4.3	4.3	4.3	12.0	9.0	1.1	0.5
2"	4.9	4.9	4.9	4.9	4.9	4.9	4.9	15.0	12.0	1.3	0.6
Ceiling	6.1	6.1	6.1	6.1	6.1	6.1	6.1	18.0	15.0	1.6	1.0
Box	0.8	0.8	0.9	1.0	0.8	1.1	1.1	0.75	0.5		
Wall	1.3	1.3	1.4	1.4	1.4	1.0	1.4	0.7	0.6		
Box											

- A—Reinforced concrete
- B—Concrete slab—tile filler
- C—Steel pan—metal lath and plaster
- D—Suspended ceiling work—conduit in slab
- E—Suspended ceiling work—conduit in ceiling
- F—Wood Frame
- G—Tile arch
- H—Exposed on concrete, brick or iron
- I—Exposed on wood or plaster

ORDINARY CONDITIONS	BRANCH CIRCUIT WIRE AND DEVICES	HRS.	PER
	No. 14 or No. 12 wire—ordinary conditions.....	7.0	M
	No. 14 or No. 12 wire—complex conditions.....	9.0	M
	10 amp. single pole switch and plate.....	20.0	C
	10 amp. double pole switch and plate.....	30.0	C
	10 amp. 3-way or 4-way switch and plate.....	40.0	C
	10 amp. flush receptacle and plate.....	20.0	C
	Drop cords—to make up and install.....	0.5	Each
	Sign receptacle in box cover.....	0.35	Each
	Floor box—single gang.....	1.4	Each
	Pendant fixture and shade.....	0.45	Each
	Ceiling fixture and shade.....	0.5	Each

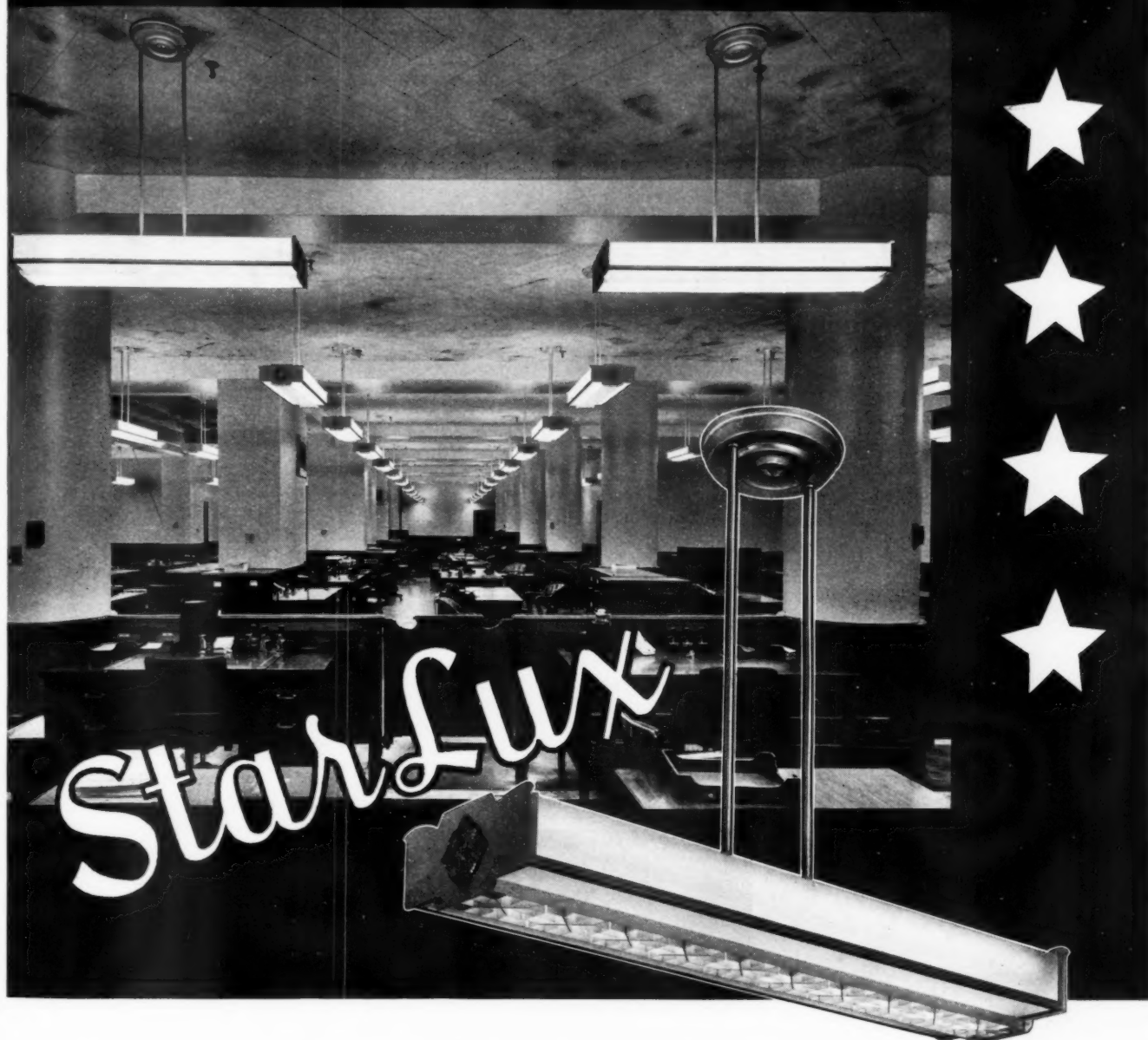
CONDUIT AND BOX FASTENINGS	HRS. EACH
Expansion bolt in brick.....	0.2
Expansion bolt in concrete.....	0.3
Toggle bolt in tile.....	0.15
Wood screws.....	0.1

CUTTING HOLES	HOURS PER FT.
Tile.....	0.3
Brick—medium.....	1.0
Brick—hard.....	1.5
Concrete.....	1.75

Waterbury News

Martin O'Rourke, City Inspector in Waterbury, Conn., and R. O. Mills, illuminating engineer, with the Connecticut Light and Power Company have been active in the revival of the old Waterbury Electrical League and a new local Electrical Contractors Association has been formed. The power company has established a power factor penalty clause that is expected to stir up a bit of factory business, and store work where fluorescent lamps are lagging.

Sell CURTIS *and you sell satisfaction*



GET THE FACTS ABOUT THIS PROFITABLE ITEM

This beautiful pendant is the outstanding four lamp fluorescent luminaire for 1941. Introduced only a few months ago, StarLux is already in the front rank in sales and satisfaction. You can recommend StarLux to your store and office lighting prospects with full confidence that it will do the job. It carries

the Underwriters' Label and is a certified Fleur-O-Lier. The standard unit (illustrated above) is a 200-watt unit for 4-48" lamps, completely wired and ready to attach to ceiling outlet. StarLux is also available for use in continuous lines. *Write today for our new bulletin, Serial 2039.*

Curtis Lighting, Inc.

6135 W. 65th Street, Chicago, Ill.

Questions ON THE Code

Answered by
F. N. M. SQUIRES

Chief Inspector New York Board of Fire Underwriters

A Portable Motor Application

Q. "A portable room cooler contains a three phase compressor motor and a single phase fan motor controlled by switches on a cabinet which houses them. A flexible cord connects these to a wall receptacle. Will the Code permit one lead of flexible cord to run directly to the motors and not go through the switches on the cabinet?"—B.A.S.

A. Before connecting up such a unit to a receptacle by means of flexible cord, it must be made certain that the appliance is portable. If secured to an exhaust duct for exhausting the hot air or if connected to water pipes for cooling, it is not portable and must not be connected by flexible cord but must be wired in a permanent manner.

The question about running one flexible cord directly to the motors probably refers only to the fan motor as it would not be practicable nor desirable not to use the switches on the cabinet to control the compressor.

So, if the appliance is portable and the fan motor is $\frac{1}{4}$ hp. or less, the fan motor may be connected directly to an attachment receptacle by means of a flexible cord as for this size portable motor the Code in 4383C permits an attachment plug and receptacle to serve as the controller.

As the compressor motor is larger it must have a controller which, in this case, would be the switch on the cabinet.

Fluorescent Strips

Q. "Is it permissible to use fluorescent strip lighting fixtures for raceways, for one or more circuits? Is it permissible to use the knock-outs in these fixtures and run conduit from fixture to fixture, instead of using a

regular outlet box in the ceiling?"—C.W.M.

A. There are three makes of surface raceways listed by Underwriters' Laboratories which may be used as suggested above provided the following restrictions are observed,—for use only with lampholders for tubular fluorescent lamps mounted directly on the raceway; resistors for d.c. units to be located in other enclosure apart from the raceway; not more than ten No. 14 or No. 12 wires to be used in the raceway (and less of larger wire); wires to be of a type suitable for 75° C.

This last restriction means that the wires are to be of the heat resistant, type RH or RHT, or of the asbestos varnished cambric, type AVA or AVB, insulation only.



EQUIPMENT FRAME grounding requires better connections and protection for the connections, says George Welman, electrical engineer of the Louisiana Insurance Rating Bureau. Field experience indicates, he says, that grounding conductors attached to motor frames are often found unprotected and in a damaged condition.

With the above in mind, it would be permissible to run the circuit conduit into the knockouts in the raceway. Of course, using armored cable which has only type R wire would not be permissible in this manner.

The three raceways listed by Underwriters' Laboratories for this use are those of, Curtis Lighting, Inc., Day-Bright Lighting, Inc. and The Wire-mold Co.

It would not be permissible to use any other fixtures (or strips) than the three mentioned above as raceways for circuit wiring.

Bare Neutral

Q. "Would it be permissible to use two, single conductor, non-metallic Parkway cables, together with a bare neutral, as an underground 3-wire-220-volt service?"—E.M.

A. Sub-paragraph "a" of section 2304 permits the use of the bare neutral in services but the last sentence of this sub-paragraph "a" states that "except in the service drop such an un-insulated conductor shall be part of an approved type of service cable or shall be installed in a rigid metal raceway." Therefore, the Code would not permit the use of two separate single conductor underground cables with a separate bare conductor for a neutral.

Slow Burning Wire in Conduit

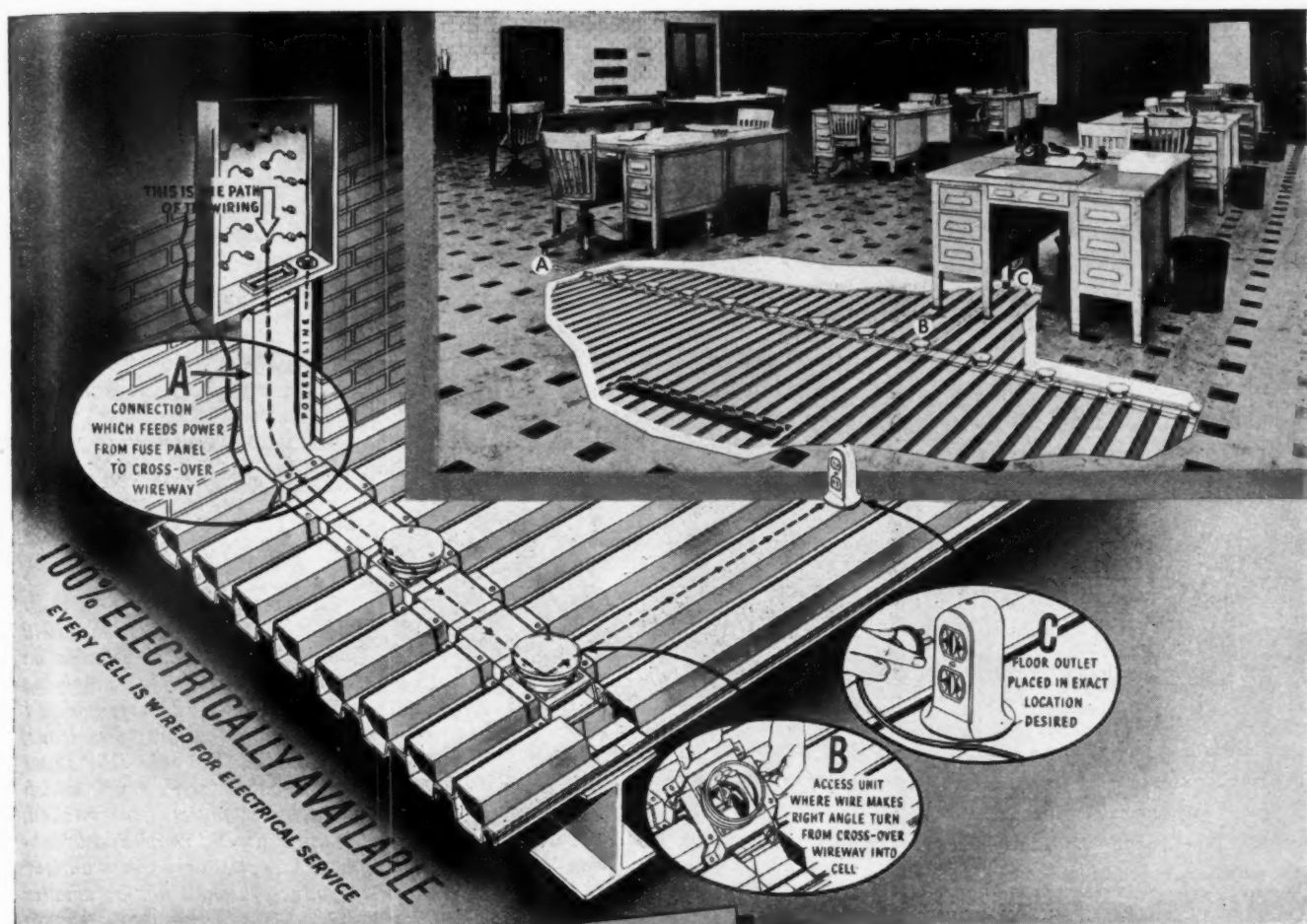
Q. "When can slow-burning be used in conduit?"—F.R.B.

A. Paragraph 3005a states that slow-burning conductors (types S.B. and S.B.W.) may be used only where the room temperature will exceed 85°C (185°F.)

Unfused Taps

Q. "Article 240, Section 2434c (taps not over 5 feet long). Does this include motor circuits or only apply to panelboards and switchboards?"—C.P.R.

A. Exceptions b, c and d to the basic rule in the first paragraph of Section 2434 originally came from the rules on motor circuits. While some variations of these exceptions were permissible on motor circuits in the 1923, 1925, 1928 and 1930 Codes, they were not allowed on general wiring until the 1933 Code.



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Too many new buildings have been electrically obsolete before the first tenants have moved in . . . because of inadequate wiring capacity. Q-Floors are the cure for obsolescence. Study the detailed illustration shown above and you will quickly see how Q-Floors,

with greatly increased electrical capacity, not only meet present demands but provide for every new electrical development in the future. Note the parallel wiring raceways on 6-in. centers over the entire floor area. Q-Floored buildings are electrically **ALIVE!**

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These labels mean certification by E.T.L. They mean assurance of good lighting, balanced performance and satisfactory service. They mean that compliance with exacting specifications has been checked by test. They mean protection for you.

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These labels certify compliance with 54 rigid specifications for better light, electrical dependability, and sturdy construction . . . as established by the Illuminating Engineering Society . . . and checked by E.T.L. test. On reflector, shade and lamp base, they mean protection for you.

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This label means a new certification service by Electrical Testing Laboratories, covering residential lighting fixtures. Specifications are now available. Again, it is protection for you.



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ELECTRICAL TESTING LABORATORIES

EAST END AVENUE AT 79th STREET, New York

Questions
IN THE Code

[FROM PAGE 801]

The motor rules, however, always have required that the unfused tap be at least one-third of the size of the feeder and that requirement is still in effect and is in the 1940 Code.

Therefore, any application of the provisions of 2434c which would tend to provide for an unfused tap of less than 1/3 the size of the feeder, would not be permissible on motor circuits and only applies to panels and switchboards.

The No. 12 Wire Circuit

Q. "According to rule 2125b (1940 Code) receptacles are allowed on 15 ampere branch circuits for supplying appliances at not over 12 amp, which I presume would be toasters, flat irons, washing machines. Yet rule 2109 states 'that in dwellings, branch circuits which supply receptacle outlets in kitchen, laundry, pantry, dining room and breakfast room, shall not supply other outlets, and the conductors shall not be smaller than No. 12.'"

(A) "Does this mean that all receptacle outlets in above rooms must be put on a separate circuit of No. 12 wire for the washing machine, flat iron, etc?"

(B) "I presume that a flat iron, toaster, etc. could be used on the 15 amp. circuit as long as the receptacles were not located in the rooms designated in 2109, because 2125b allows receptacles for supplying appliances if they are not rated at over 12 amp. What is your opinion?"—F.R.B.

A. Section 2109 requires that any and all branch circuits which supply receptacles in the rooms mentioned, be wired with No. 12 (or larger) wire and that any such circuit (or circuits) do not supply fixtures or permanently connected appliances. In other parts of the house (other than the rooms mentioned in 2109) toasters, flat irons, etc. may be plugged into receptacles on 15 ampere circuits.

Interconnection of Circuits

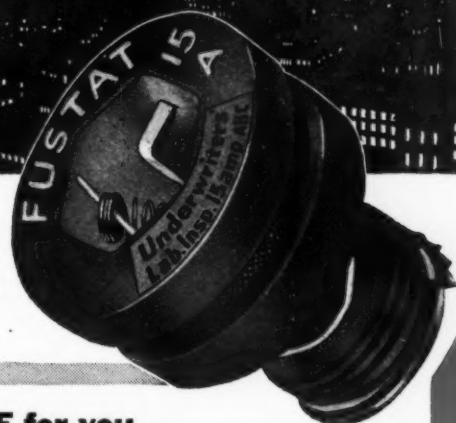
Q. "Given—New house to be wired with armored cable.

"Proposed—to run 3 wire No. 12 cable to an outlet and there split the 3 wire circuit into two 2 wire circuits, one

A Type S (non-tamperable) fuse
that is
practical
for the user
and
profitable
for You!



Retails at
7½¢
 in 15 to 30 amp. sizes



PRACTICAL for the user

because it stops needless blowing — and thus wipes out any excuse for tampering. The long time-lag of the fustat prevents it from blowing when motors start on washing machines, refrigerators and other such appliances. Yet it . . .

**Protects flexible cords against burnout —
 in spite of long time-lag**

The fustat contains a fuse. The ability of a fuse to protect against dangerous cord shorts or grounded sockets is well known. The fustat . . .

HOLDS like a large fuse when safety permits —
OPENS like a small fuse when safety demands.

Prevents circuits being robbed of protection

The fustat protects the user against anyone unwittingly creating a fire or injury hazard thru haphazard practices.

Unlike ordinary fuses a fustat cannot be replaced with a penny — or with a size too large to protect. In fact, side-tracking the fustat in any way is practically impossible without destroying the fustat or adapter and thereby showing the user that his protection is gone.



Fits present fuseholders

Thru the use of an inexpensive adapter, that locks in place, the fustat fits in any standard Edison base fuseholder.

On new jobs you can specify that panels, switches etc. be equipped with fustat bases.

Retails at 7½¢

PROFITABLE for you

because it permits adding more appliances to present circuits. The circuit can be loaded right to capacity with perfect safety — and without needless blows even when motors are started. This often saves the expense of a new circuit and helps close a sale.

Stops dangerous overloading of circuits

Since it is practically impossible to replace the fustat with anything but another fustat of the correct size — circuits cannot be loaded beyond safe capacity. If additional circuits are needed the user cannot readily side-step the issue by overloading the circuit at the sacrifice of safety.

**Reduces loss of time and money on
 needless "blown-fuse" service calls**

When a fuse blows on a starting current everybody loses. The user's service is off . . . the service man may be dragged away from more profitable work . . . the full cost of the call may not be collected if the user kicks about paying it just to have a fuse changed . . . the whole electrical industry loses because needless interruptions of service are costly, annoying and unnecessary. The fustat stops this senseless waste by eliminating such "false-alarm" service calls.

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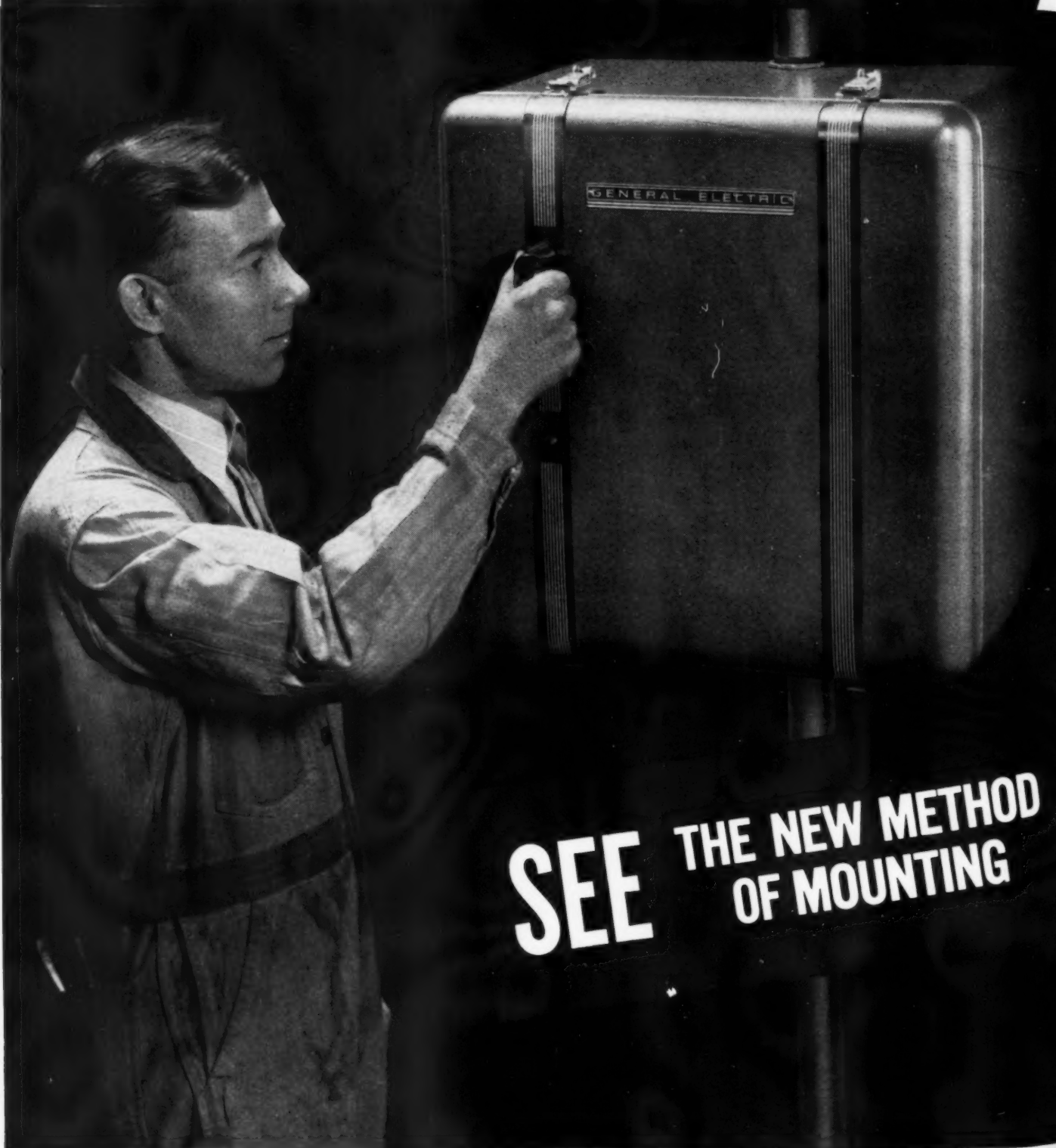
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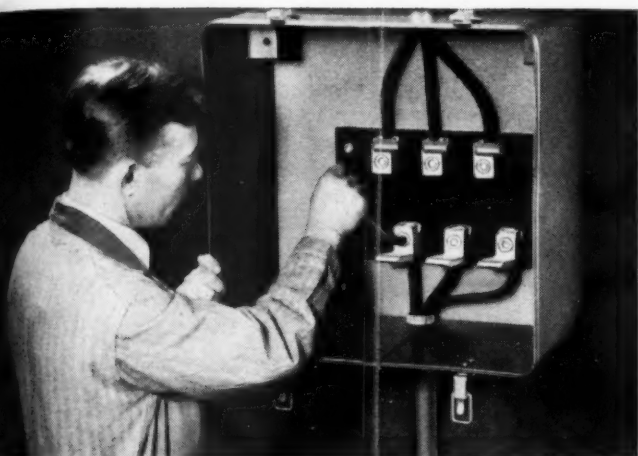
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**SEE THE NEW METHOD
OF MOUNTING**

A Removable Air Circuit Breaker

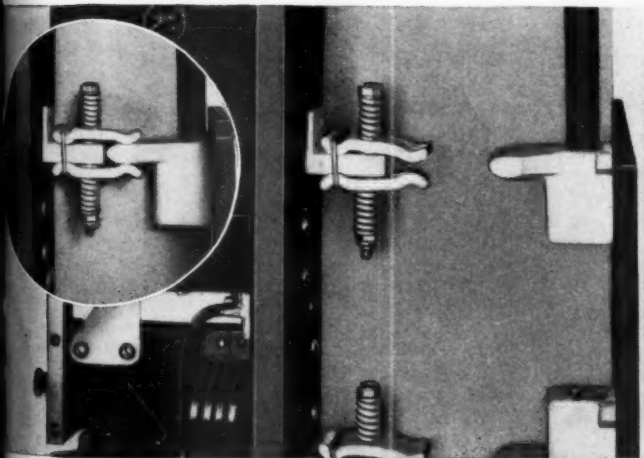
So Easy to Install... So Easy to Inspect



1 Bolt case to wall and connect cables to solderless connectors.



2 Place breaker unit on brackets in enclosing case.



3 Breaker pivots into connected position automatically when pushed into place. Spring contacts engage solid contacts.



4 Bolt breaker base in place. Put on cover and handle. Breaker is ready to operate.

Take a good look at this air circuit breaker. Note the convenient, attractive new case which completely encloses the breaker unit, making it dustproof. See how the ingenious new mounting features simplify installation and inspection.

A new pictorial booklet that gives all the facts is

just off the press. It shows how this enclosed breaker meets your needs for safe and reliable service on low-voltage circuits. Call the G-E office or distributor nearest you and ask for a copy of GEA-3600 or, if you prefer, address General Electric Company, Schenectady, New York.

GENERAL ELECTRIC

860-12-7500

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—The New Line of

RACOLET

These Conduit Bodies, Standard and F. S. Types are the newest addition to the famous, nationally known Raco. All-Steel Line. Measuring up in every way to Raco. All-Steel's reputation for quality, the new Racolets embody the finest workmanship. The bodies are malleable iron, finely finished with a heavy coating of cadmium. Cover openings are surface ground . . . deep, clean-cut tapered threads. Hub edges are chamfered for easy introduction of conduits.

These new Racolets are modern and streamlined. There's plenty of room as there are no protruding screws or ears. Backs are semi-flat for rigid and uniformly flat mounting.

Available in threaded type for rigid conduit and threadless type for E.M.T. All the necessary covers are included in the line.

Explosion-proof fittings for hazardous locations, too, are found in this new line . . . including Line-Sealing fittings. And, of course, there are Vapor-Proof Fittings . . . both rigid and pendant types.

Write today for the new catalog, describing this new line. It's yours for the asking. Distributed Nationally by ALL-STEEL-EQUIP COMPANY, INC., 605 Griffith Avenue, Aurora, Ill.



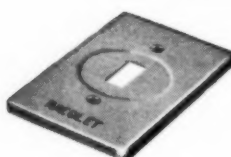
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Standard Threaded Bodies
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FS Bodies Available in 1-,
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Standard Threadless
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Explosion Proof
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RACO • ALL-STEEL • PRODUCTS
Switch Boxes • Outlet Boxes • Cutout Boxes • Cabinets • Conduit Fittings
Distributors in All Important Centers

Questions
ON THE Code

[FROM PAGE 82]

circuit to be used for the appliance circuit, the other circuit for general lighting.

"After continuing the two separate circuits it is found to be convenient to tap the neutral of the appliance circuit to feed the identified side of a lighting fixture and to derive the other side of this circuit from the unidentified (or black) wire of the general lighting circuit.

"Question—is this a violation of Sections 2104-2109?"—C.T.B.

A. If this is an armored cable installation and after running to the "outlet" mentioned each 2 wire circuit is run in separate armored cables, the proposed scheme would be a violation of Section 3052.

If the wires are not run within a metal enclosure or armor there would be no particular violation of the Code by such an arrangement unless the neutral of the appliance circuit would thereby be overloaded. However, such a connection would be highly not recommended and would be frowned upon by many inspectors.

Conduit on Concrete

Q. "Is it compulsory under the Code to pull lead cable in conduit, where the conduit is laid on top of a concrete floor, said concrete floor being laid next to the earth? On top of concrete floor there has been placed two by four timbers, for screeds, to support the wood floor. In other words, the wood floor is laid on top of the concrete flooring."—C.W.M.

A. This would not require the use of lead covered wires in the conduit unless the concrete under the wood floor is continually wet which is very unlikely as the wood would soon rot out.

The Code requires the use of lead covered wires in conduit which is imbedded in concrete which in turn is in contact with the earth, but in this case the conduit is not within, but is on top of, the concrete.

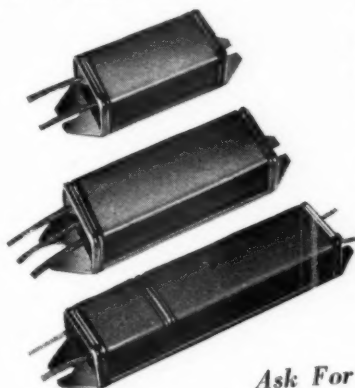
But it would be very easy to block up the conduit off the concrete a little so as to provide an air space under the conduit.

Also, why not build up a little reputation for a better class of work by using type R.W. wire?

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A COMPLETE INDUSTRIAL TRANSFORMER SERVICE

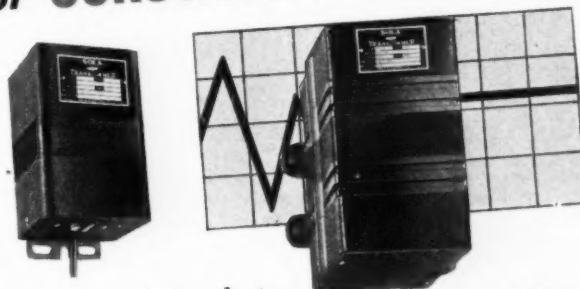
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For this new, rapidly growing field, Sola manufactures a full range of compactly designed controls and reactors of unequalled performance. Low power loss—cooler and quieter operation. Thousands in use in leading installations.

Ask For Bulletin **JFL - 72**

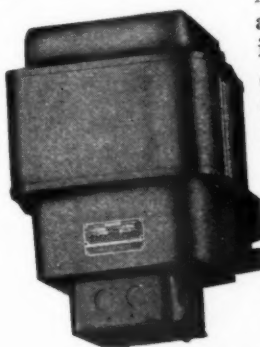
For CONSTANT VOLTAGE



Transformers designed to maintain constant output voltage regardless of line fluctuations. Standard capacities from 10 VA to 10 KVA to replace non-regulating transformers, or as auxiliaries to present equipment.

Ask For Bulletin **JCV - 74**

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Ask For Bulletin **JPC - 14**

For NEON SIGNS . . .



From the smallest point-of-sale sign to the dominating outdoor spectacular, Sola offers a complete range of Power Factor Corrected Luminous tube transformers with the famous Sola "Core Type" construction. Out-door, indoor, weatherproof and core and coil types in capacities from 1000 V to 15,000 V, 12 MA to 360 MA.

Ask For Bulletin **JLT - 67**

For MERCURY LAMPS



A complete line of transformers specially designed for the operation of high

Ask For Bulletin

intensity, high or low power factor mercury vapor lamps in 250 watt and 400 watt capacities. Indoor wall types with inclined terminal board permitting unobstructed access to all connections. Cylindrical type for suspension between the reflector and the ceiling, an integral part of the lighting fixture. Also low cost core and coil types.

JMV - 76

For SIGNALS and CHIMES



Low voltage units specially designed for the operation of door bells, buzzers and chimes. In capacities ranging from 5 VA to 25 VA—6-18-24 volts. Small, compact, dependable, double wound units with varnish impregnated coils and air-cooled core. Encased types are provided with inclined terminal boards in a roomy outlet box. Heavy duty types from 50 to 750 VA for multiple bell, signal and alarm systems.

Ask For Bulletin **JBC - 52**

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FLUORESCENT LIGHTING

1 Catalog No. 44 illustrates and describes this line of commercial and industrial fixtures. It also includes bed, desk, floor, pulpit and music lamps. Faires Manufacturing Co.

LUGS AND CONNECTORS

2 A folder featuring solderless lugs and connectors. It shows standard and stud terminal "Handi-Lugs", "Handi-Two Way" connectors, combinations of "Handi-Lugs" and P-X-T triple duty connectors. The Trumbull Electric Manufacturing Co.

ELECTRICAL EQUIPMENT

3 Digest No. 126 is the Spring issue and contains listings and prices of safety switches, service equipment, multi-breakers and circuit breakers, panelboards, motor control and pressure switches. Square D Company.

MOTOR

4 Descriptive data 3706 describes two large totally enclosed fan-cooled type CS motors. It also gives a discussion of air circulation, construction and operation. Westinghouse Electric and Manufacturing Co.

LIGHTING EQUIPMENT

5 Catalog 40 consists of 112 pages of information on Permaflexor lighting. It features descriptions, illustrations, specifications and performance advantages. Pittsburgh Reflector Co.

CONTROLLERS

6 Booklet GEA-3531 tells how to select control for d.c. motors. Illustrations and charts are given. General Electric Co.

WIRE CATALOG

7 A 52-page catalog containing specifications for every type of building wire and cable. Also included are companion products such as fixture wire, non-metallic sheathed cables, service entrance, service drop and underground service entrance cables. United States Rubber Co.

CONNECTORS

8 A 20-page booklet entitled "First Aid," consisting of illustrations and descriptions of the "Gorilla Grip" connectors. National Electric Products Corporation.

INSULATING MATERIAL

9 A folder giving the characteristics of varnished Fiberglas, black and yellow. Samples are attached. Irvington Varnish & Insulator Co.

INSTRUMENTS

10 Bulletin No. 750 describes the new Standco Universal type hand tachometer, direct reading, centrifugal type. Herman H. Sticht Company, Inc.

MOTORS

11 Folder GEA-3513 features the complete line of fractional horsepower direct current motors. General Electric Co.

LAMP BALLASTS

12 A fluorescent lamp ballast catalog covering the entire line of 62 types and sizes of Acme lamp ballasts. Acme Electric & Mfg. Co.

LIGHTING UNITS

13 Leaflet F-8604 illustrates and describes the new 100-watt fluorescent luminaires for industry. Westinghouse Electric and Manufacturing Co.

PARKWAY CABLES

14 Catalog J-862 consists of 16 pages of data on metallic and non-metallic parkway cables. John A. Roebling's Sons Co.

PROPELLER FANS

15 Catalog No. 12 consisting of 28 pages of descriptions and illustrations on propeller fans for commercial and industrial applications. Contains data on fan laws and formulae used in performance calculations. Hartzell Propeller Fan Co.

VENTILATING EQUIPMENT

16 A 48-page sales manual on Circulair, cooling and ventilating equipment. It is entitled "Take Off to Money in Circulation." Kisco Company, Inc.

LIGHTING FIXTURES

17 Catalog No. 41 consisting of 32 pages of illustrations and descriptions of this line of residential and commercial lighting fixtures. Moe Brothers Manufacturing Co.

WIRING DEVICES

18 Bulletin No. 1140 features mid-get Triploc plugs and receptacles, contact units, and receptacle housings. The Pyle-National Company.

CONDENSERS

19 Catalog covering general line of electrolytic, paper, oil, exact-duplicate replacements, transmitting and other condensers, together with motor-starting capacitor selector and capacity-resistance bridge. Aerovox Corporation.

SWITCHES

20 Catalog Section 36-162 describing and illustrating the rural line switches for lightly loaded distribution circuits. Westinghouse Electric and Manufacturing Company.

FLUORESCENT STANDARDS

21 A 16-page booklet listing 50 standard tests for lighting effectiveness, electrical safety, mechanical soundness, electrical excellence and performance, of fluorescent fixtures. Fleur-O-Lier Manufacturers.

GLOW LAMPS

22 Catalog sheet No. Y-0251 gives specifications of clear and sprayed glow lamps, lists technical data, illustrates and describes typical applications in homes, commerce and industry. Nela Specialty Division, G. E. Lamp Department.

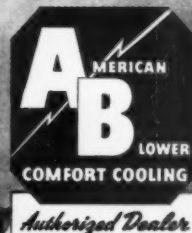
(Continued on Page 90)

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*are walking
on air!*

It's Comfort Cooling—and Electric Ventilation time... Business is booming with American Blower Dealers not only because they sell the most complete line in the industry, but also because American Blower products are recognized everywhere for their quality, dependability and extra value. (They can be sold on F. H. A. Pay-by-the-Month Plan through The Heating and Plumbing Finance Corp.)

Then, too, American Blower's colorful, effective, direct mail, magazine and newspaper advertising campaigns and dealers' sales helps are already at work, creating sales, bringing prospects in to authorized American Blower Dealers. If you are



active, energetic and want to make real money selling Comfort Cooling and Electric Ventilating Equipment, investigate the American Blower franchise TODAY. Get in this permanent, profitable business NOW. Mail the coupon, ask your jobber, or phone the nearest American Blower Branch Office today.

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AMERICAN BLOWER CORPORATION, 6000 Russell Street, Detroit, Mich.
Division of American Radiator and Standard Sanitary Corporation
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Mail coupon to:

Please send a copy of your new 1941 Sales and Advertising Plans to:

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Firm Name _____

Street _____

City & State _____

FANS

23 A 28-page catalog consisting of information and illustrations of this line of desk, pedestal, vent, exhaust, air circulator fans and automatic shutters. Signal Electric Mfg. Co.

MOTORS

24 A folder illustrating and describing totally enclosed fan cooled squirrel cage induction motors. Century Electric Co.

OIL CIRCUIT BREAKERS

25 Catalog 3940 outlines Type MS-2 oil circuit breakers. Illustrations, application and construction data are given. Roller-Smith Co.

TRANSFORMERS

26 Bulletin 211 tells how to apply CSP power transformers, which are self-protecting, self-contained substations for single feeder service, on municipal or industrial distribution systems. Westinghouse Electric Mfg. Co.

LAMPS

27 Booklet B Supplement describes mazda fluorescent lamp performance in service and gives operating, maintenance and testing suggestions. General Electric Co.

CONTROLS

28 Catalog 241 features the all-electric floatless controls. Description, illustrations, wiring diagrams, prices and specifications are given. Bender Warrick Corp.

MOTORS

29 Descriptive data 3706 covers the fan-cooled explosion resisting motors. It discusses the application of large motors in Class I, Group D haz-

ardous locations. Westinghouse Electric & Mfg. Co.

SUBMARINE CABLES

30 A 16-page booklet, Form 6118, on Amarine non-leaded submarine cables, with illustrations of various applications and descriptions of typical installations. American Steel & Wire Co.

INDUSTRIAL FIXTURES

31 Bulletin F-45 announces the new "Super Two-Hundred" industrial fixtures for two 100-watt fluorescent lamps. Day-brite Lighting, Inc.

DOOR CHIMES

32 A four-page bulletin introducing the new Plaque line of door chimes, utilizing hand-painted porcelain covers. Illustrations, descriptions and prices are given. Liberty Bell Mfg. Co.

MAGNETIC STARTERS

33 Circular No. 330 covers a new line of combination magnetic starters, including motor circuit switch disconnect and magnetic starter in one cabinet. Trumbull Electric Mfg. Co.

BEARINGS

34 Catalog No. 410 consisting of 76 pages of data on bearing bronze, with sections on general purpose bearings; oil grooving; cored bars; solid and hexagon bars; babbitt; graphite bearings; Ledaloyl self-oiling bearings; decimal equivalents and electric motor bearings. Price List also included. Johnson Bronze Company.

CONNECTORS

35 Catalog 4C, consists of 48 pages of descriptions, illustrations, dimension tables and prices on this line of solderless electrical connectors. Frankel Connector Co., Inc.

FUSE CUTOUTS

36 Bulletin 215, 32-pages, features this line of fuse cutouts, including open and enclosed types as well as light, medium and heavy duty reclosing cutouts for automatic restoration of service. Schweitzer & Conrad, Inc.

TROLLEY DUCT

37 Bulletin 407 is entitled "Mobile Electricity" for feeding portable electric tools, cranes, hoists and similar moving loads with industrial type Trolley-Duct. Bull Dog Electric Products Co.

MAGNETIC STARTER

38 Bulletin GEA-841K features CR7006-D40 magnetic starter, a full-voltage starter for induction motors. General Electric Co.

FITTINGS

39 Folder CB lists Racolet line of fittings, including conduit bodies, explosion-proof fittings and vapor-proof fittings. All-Steel-Equip Company.

AIR CIRCUIT BREAKERS

40 Application Data 35-100 gives new information on large air circuit breakers, according to NEMA's new standards for breaker interruption ratings. Westinghouse Electric and Manufacturing Co.

LIGHTING FIXTURES

41 Catalog 41-FL consists of 24 pages of descriptions and illustrations on commercial fluorescent lighting fixtures. Watco Engineering Inc.

BUILDING WIRES

42 A 24-page book entitled "Interpreting the New Code in Terms of New Building Wires". Ratings of new wires and type R are graphically shown in tables for both new and re-wiring classes of work. General Cable Corp.

TRANSFORMERS

43 Bulletin No. 112 gives illustrations and description of Type UD distribution transformers. R. E. Uptegraff Manufacturing Co.

BELLS AND PUSH BUTTONS

44 Catalog illustrating and describing this line of bells, buzzers, push buttons and bar push. Ansonia Electrical Co.

CAPACITORS

45 A 6-page brochure entitled "A Quick Cure For Hot Wires" points out how capacitor installations may increase current handling capacity and contribute to more efficient operation of all equipment in the system. Cornell-Dubilier Electric Corp.

BALLASTS

46 Bulletin 411-FL contains information and illustrations of this

(Continued on Page 92)

Circle numbers, sign and paste on a penny postcard or mail in an envelope.

ELECTRICAL CONTRACTING														May	
330 West 42d St. New York, N. Y.															
(Not good after July 1)															
Please send me without obligation, manufacturers' literature herein described and identified by numbers circled below.															
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31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	
46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	
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APPLETON UNILETS- STANDARD FOR BETTER WIRING

FORM 35
UNILET
"Type T"



CHECK THESE APPLETON FEATURES

- ✓ Smooth, sturdy, cast malleable iron bodies. No holes, blemishes, gating marks.
- ✓ Perfect hub alignment; every body true in shape.
- ✓ Skillfully designed to provide smooth, roomy wireway.
- ✓ Heavily cadmium coated for lifetime resistance to rust and corrosion.
- ✓ Waterproof, corrosion-proof joints.
- ✓ Every Appleton Unilet carries the Appleton trade-mark.

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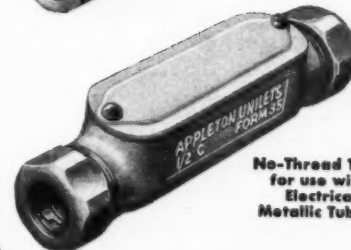
**40
DIFFERENT
THREADED BODIES
...20 NO-THREAD...
IN "FORM 35" ALONE**



Threaded Type
for use with
Rigid Conduit
(Heavy Wall)



No-Thread Type
for use with
Rigid Conduit
(Heavy Wall)



No-Thread Type
for use with
Electrical
Metallic Tubing



The name "Appleton" is the registered trademark. "Unilets" or the famous circle-A Appleton trade-mark shown above, appears on every Appleton fitting. We manufacture no private brand goods!

APPLETON

Conduit Fittings • Outlet and Switch Boxes • Explosion-proof Fittings • Reelings

USE G-E

Quality RIGID CONDUIT

**G-E WHITE
HOT-DIPPED
GALVANIZED**

**G-E BLACK
ENAMELLED**

- UNIFORM
- EASY BENDING
- ACCURATE THREADS
- SEAMS WON'T SPLIT
- PROPER FITTINGS

General Electric offers a choice of two conduits—each a leader in its class.

G-E White rigid conduit gives lifetime protection to wiring systems. It is hot-dipped-galvanized and Glyptal-coated inside and out. This method of manufacture provides a heavier layer of zinc than could be applied in any other way and bonds the zinc to the steel.

G-E Black rigid conduit is coated inside and out with a corrosion-resistant elastic black enamel. The mild steel tubing used for this conduit is the same as that used for G-E White.

G-E conduits are easy to work with and install. Threads are clean and accurate. Wire can be pulled quickly. Proper boxes and fittings are available.

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Appliance and Merchandise Dept.
Bridgeport, Conn.

Sirs: Please send me a G-E Conduit Products catalog, Pub. No. 53-1.

Name

Address

City State

GENERAL  ELECTRIC

New Literature

[FROM PAGE 90]

line of ballasts for fluorescent lamps, with data and dimensions for all ballasts from 4 to 100 watts capacities. Jefferson Electric Co.

INSULATING VARNISH

47 A folder describing Harvel 612-C insulating varnish. It also shows photographs of applications and laboratory tests and includes data on methods of application, giving suggested schedules for baking. Irvington Varnish & Insulator Co.

FANS

48 Bulletin FU-41, a 20-page catalog illustrates and describes this line of cooling and ventilating equipment. It contains installation and application data. Wagner Electric Corp.

POWER TRANSFORMERS

49 Bulletin No. 111 describes process of manufacture and shows power transformers through various stages of assembling. R. E. Uptegraft Manufacturing Co.

BEARINGS

50 A folder describing Torflex flexible bearings, recommended for noise, vibration and lubrication elimination; impact and shock absorption; parallel and angular misalignment compensation. Harris Products Co.

MOTORS

51 Bulletin BCA 120 features capacitor single phase motors up to 20 horsepower. Century Electric Co.

ADJUSTABLE SPEED DRIVE

52 Bulletin 310 illustrates and describes an all-electric adjustable-speed drive for alternating current circuits. Reliance Electric & Engineering Co.

LIGHTING

53 A folder entitled "How to Dramatize Merchandise with Decorative Lights." Century Lighting, Inc.

INDUSTRIAL CAPACITORS

54 A new Industrial Capacitors Manual gives application data, listings of electrolytic and oil motor-starting capacitors. Aerovox Corporation.

MOTORS

55 GEA 1974B gives construction, ratings and applications of FHP polyphase motors. General Electric Co.

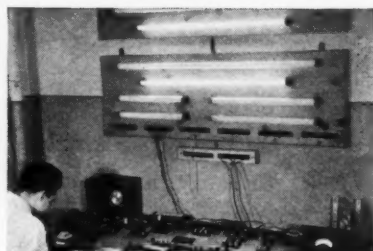
PUSHBUTTON STATIONS

56 Bulletin 100 illustrates and describes Type "D" pushbutton stations for heavy duty service. Dimension drawings are also given. The Clark Controller Co.

(Continued on Page 94)



General inspection of the fluorescent unit



Life test of fluorescent lamp starters



★ CERTIFIED!

For the protection of you and your customers. FLEUR-O-LIERS are certified by Electrical Testing Laboratories as meeting 50 rigid specifications for good light—safe, reliable service, as set up by MAZDA lamp manufacturers.

OVER 40 LEADING FIXTURE MANUFACTURERS PARTICIPATE IN THE FLEUR-O-LIER PROGRAM

FLEUR-O-LIER Manufacturers

Participation in the FLEUR-O-LIER MANUFACTURERS' program is open to any manufacturer who complies with FLEUR-O-LIER requirements

CHECK THESE Vitaly Important Facts THEN SELL Certified★ FLEUR-O-LIERS!

● Your customers want them—and you'll want to sell these smart, efficient *Certified* fluorescent lighting fixtures—because you can sell with *confidence*—sell with *assurance* that these *facts* spell satisfaction to all users!

Certification to 50 rigid specifications include these important points:

- ★ **Certified control equipment**—ballasts and starters are CERTIFIED to give balanced, economical, satisfactory operation.
- ★ **Maximum light output**—all FLEUR-O-LIERS must give high percentage of useful light... at least 75% for bare fixture—65% for shielded fixture.
- ★ **Safety**—fixture must stand voltage test of 2,000 volts—electrical leakage must not exceed 0.2 milliamperes.
- ★ **Ease of maintenance**—FLEUR-O-LIERS are easy to clean—easy to re-lamp—all important parts easily accessible.
- ★ **Durability**—Suspension of fixture must withstand five times its own weight—must withstand usual conditions of wear, and shall not peel, chip or be easily damaged.
- ★ **Reduction of flicker**—all FLEUR-O-LIERS are designed to reduce flicker to a minimum.
- ★ **High power factor**—Equipment used in the construction of a FLEUR-O-LIER must provide a power factor of 85% or above.

Over 100 different industrial and commercial Certified★ FLEUR-O-LIERS are now available in a wide variety of prices!

Powerful National Advertising

Advertising in 26 leading trade and business papers gives your customers a dynamic FLEUR-O-LIER story—helps you sell.

GET THIS NEW BOOKLET FREE!

tells you why Certified★ FLEUR-O-LIERS are the key to the best in fluorescent!

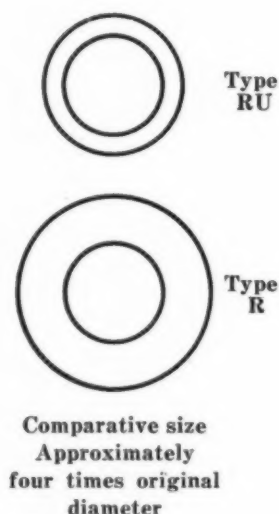


TEAR OUT AND MAIL

Fleur-O-Lier Manufacturers • 2122-B Keith Bldg., Cleveland, Ohio
Please send me new booklet "50 Standards for Satisfaction" about Certified★ FLEUR-O-LIERS, packages of indoor daylight.

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Address _____
City _____ State _____

There's Money in Rewiring



Many existing buildings are as antiquated electrically as a 1913 automobile. In most cases the only way to bring these buildings up-to-date electrically is to rewire them to obtain the additional circuits necessary for modern equipment. Adding a sufficient number of larger conductors means a better, more "rentable" building for the owner and it means more work and more profit for the contractor. The only practical way to do this is to use the new small diameter building wires.

Type RU which is the smallest of the rubber insulated small diameter building wires has 90% grainless, unmilled rubber insulation. Its thin, high grade wall of insulation is more than equivalent electrically to the insulation on the heavier wall — Type R wire. If you really want to "cash in" on this new rewiring market the way to do it is to use Simplex-LATOX Type RU, small diameter building wire. Samples will gladly be sent upon request.

SIMPLEX WIRE & CABLE COMPANY
79 Sidney Street, Cambridge, Mass.

TO THE CONTRACTOR WHO NEEDS TO CUT LABOR COSTS...

The Greenlee Line of Hand Tools for the electrical contractor was developed to lower labor costs and to help speed up construction work by making the work easier and faster for the man on the job. For instance there's the complete line of Greenlee Benders that makes bending so easy for one man that you can save from 15 to 75% on labor costs. Or the handy Greenlee Knock-out Tools can save you many hours of hard work when enlarging knockouts and holes in metal. The Greenlee Cable Puller, which clamps right on to the conduit through which the cable is pulled, will save many hours of work when pulling cable. There's also a complete line of boring tools to help speed up your work.



● GET ALL THE FACTS

Send for these free folders with complete information about Greenlee Tools. You'll learn how you can save money on every job.

GREENLEE TOOL CO., 1706 Columbia Ave., ROCKFORD, ILL.

New Literature

[FROM PAGE 92]

LINESTARTERS

57 Descriptive data 11-204 gives new information on "De-ion" line starters for squirrel-cage and wound-rotor induction motors up to 7½ hp. Westinghouse and Electric and Manufacturing Co.

FEED OILERS

58 Bulletin 26-A illustrates and describes this line of unbreakable dust-proof gravity feed oilers, with a removable oil filter. Trico Fuse Mfg. Co.

FANS

59 Catalog X4049 consists of 25 pages of data on this line of fans, air circulators and kitchen ventilators. Emerson Electric Manufacturing Co.

MOTORS AND GENERATORS

60 Leaflet B-6131 illustrating and describing Lo-Maintenance Type E, direct current motors and generators for ratings up to 200 hp. and 150 kw. Allis-Chalmers Mfg. Co.

STAGE LIGHTING

61 Bulletins Nos. 44 and 46 gives information on what's new in lighting equipment and how to light stage presentations, auditoriums, and theatres. No. 44 features permanent equipment; No. 46 portable equipment and supplies. Kliegl Bros.

CONDENSERS AND RESISTORS

62 Catalog 64 illustrates and describes dry and wet electrolytics, paper tubulars, paper filter condensers, oil filled capacitors, oil transmitting condensers, interference filters, carbon and insulated resistors. Girard-Hopkins.

TOOL

63 A folder illustrating the "Do-All" combination electric hammer and drill, Wodak Electric Tool Corp.

RECORDING INSTRUMENTS

64 Catalog Section 43-414 illustrating and describing a.c. and d.c. ammeters and voltmeters for general use. Westinghouse Electric and Manufacturing Co.

FLUORESCENT LIGHTING

65 A folder featuring fluorescent lighting for commercial and industrial use. Illustrations, features and specifications are given. Reflectors, Inc.

ELECTRICAL AND LUBRICATING DEVICES

66 Catalog No. 50 gives information on how to secure fuse protection, remove and replace fuses safely, eliminate poor contact between fuses and clips and lubricate all types of bearing surfaces with visible, automatic oiling devices. Trico Fuse Mfg. Co.

Solve DEFENSE PRODUCTION Problems with This NEW Benjamin System of Lighting with FLUORESCENT! THIS NEW BULLETIN TELLS HOW!



BENJAMIN "LITE-LINE" SECTIONS LIKE THESE



JOINED TOGETHER LIKE THIS



FORM UNBROKEN LINES OF LIGHT

ROW ON ROW

ACROSS ENTIRE ROOM

PROVIDING 30-100 FOOTCANDLES

BENJAMIN

"LITE-LINE"

FLUORESCENT LIGHTING EQUIPMENT

Distributed Exclusively Through Electrical Wholesalers

40th Anniversary Year PIONEERS IN INDUSTRIAL LIGHTING

New Quick-to-Install "Lite-Line" System Economically Provides More and Better Lighting to Increase Production Effi- ciency... This Free Bulletin Tells How!

- "Lite-Line" is your answer to the problem of economically providing more light *immediately* to increase the speed and ease of seeing, thus saving precious seconds on every production... reducing employe fatigue... and safeguarding product quality.
- Your free copy of the new "Lite-Line" Bulletin tells all about this new development which enables new plants to have new lighting installed in less time and existing plant areas to be re-lighted with the least amount of plant interruption. It brings you all the data, diagrams and information you need to plan and specify "Lite-Line" lighting to provide from 30 to 100 footcandles on the working planes—shows you why these new "Lite-Lines" and other Benjamin Fluorescent Lighting Units have been selected for the exacting requirement of leading defense plants.

*Names upon request from responsible executives.

Send for your **FREE** Copy Today!

BENJAMIN ELECTRIC MFG. CO.
Dept. H, Des Plaines, Illinois
Please send by return mail new "Lite-Line" System
Bulletin without cost or obligation.

Name _____
Firm _____
Address _____
City _____ State _____

In the News

BUREAU OF STANDARDS LIMITS WIRE SIZES

Forty-two representatives of manufacturers, suppliers and users of copper conductors attended a conference of the Division of Simplified Practice, National Bureau of Standards at Washington, April 23, to consider "A Recommended Practice for Copper Conductors for Building Purposes."

The conference adopted the recommendation of the NECA Codes and Standards Committee suggesting that cables over 500,000 circular mills should not be carried as stock sizes for the trade, but be available on special order only. It was further pointed out that this should release appreciable copper tonnage for other purposes, whereas it is now tied up in slow moving inventory items. Also the place of very large cables, thus removed from current stocks, would be better filled, from an electrical standpoint, by smaller cables connected in multiple. The group sanctioned further simplification by unanimously approving the discontinuance of wire sizes No. 5 and No. 3.

The effective date has been tentatively set as June 1, 1941. A standing committee representing manufacturers, distributors and contractors will be appointed to administer the program.

WIRE TO BE SIMPLIFIED

Definite action has been taken by George Andrae, Chairman of the NECA Code and Standards Committee, looking to a reduction in the number of types and sizes of rubber covered wire. This action embodied a recommendation to the Electrical Committee, N.F.P.A., for their consideration at the special interim meeting to be held in Chicago, June 10 and 11 at the Lake Shore Club. Other proposed Code amendments, a release of Code interpretations, a report on standardization of type S fuses and other items will also be considered at this meeting.

In his proposal of an interim amendment to the National Electrical Code, Mr. Andrae points out that standardization of sizes, elimination of excess varieties, and standard unified loading values will all help expedite the National Emergency Defense Program. Also, it will bring economies of installation, greater efficiency

and eliminate confusion in the work of electrical contractors, inspectors, architects and manufacturers. The following proposals are specified—

1. To eliminate from the 1940 National Electrical Code all types of rubber insulated wires now designated as R, RP, RPT, RH and RHT.

2. To replace all of these type letters by a new Type R.

3. That the New Type R wire will be suitable for operation at a maximum ambient temperature (not copper temperature) of 30° C. (86° F.). This New Type R wire will meet all of the present requirements for Code rubber covered wire, but it is dimensionally smaller than the present Type R wire. Sizes 14, 12, 10, and 8 AWG will have the same dimensions as the present RHT, except for wires Types SN and RU which will remain as at present. All larger sizes of wire to have $\frac{1}{4}$ -in. less insulation than the present Type R wire. It is also proposed to extend type RU wire to include size No. 6.

4. To delete the current carrying capacities for rubber covered wires from present Tables 1 and 2, 1940 Code, and to adopt for the New Type R wires the values shown in the 1937 Code, Table 1, Col. A, Chapter 9.

5. To delete the present wording of Section 3006-a and to substitute therefor: "Table 1 gives the allowable current carrying capacities for average conditions (not continuous loads) of copper wires and cables of 98 per cent conductivity."

6. To delete Note 5 following Table 2, Page 303, and to substitute the following:

"For continuous full-load operation at the maximum ambient temperature of 30° C. (86° F.), apply a correction factor of 80 per cent to the values in Table 1 for Type R wire."

7. It is proposed to delete the present table following Table 1, Page 301, and to substitute a statement that the correction factors for ambient temperatures for over 30° C. be— C—40° and 45°, F—104° and 113° with a Correction Factor of .71 and .50.

8. The 40 per cent conduit fill rule will apply except for rewiring work.

9. That other editorial changes be made so that the Code provisions be correlated throughout.

10. To consolidate the current carrying capacity tables for rubber insulated wires. No correction values are required for branch circuit wiring for sizes 14 to 10 inclusive, when up to nine conductors are used in conduit, except as required in paragraph 2107.

11. The use of Types RU and SN wires be extended to new as well as to old work, and that RU be extended to include No. 6.

12. That standard wire sizes be limited to a maximum of 500,000 cm., and that a suitable rule for paralleling conductors be inserted in the Code.

All of the above proposals are predicated on—

(a) A standard reduced wall insulation of a rubber compound superior in quality to present Code grade. This new Code wire will be smaller in diameter than present Code wire.

(b) The new wire will have the same electrical properties and aging qualities as present Code wire.

(c) The new wire will have greater carrying capacity than present Code wire and will afford considerable economy to the user, not now made available to him in the present code.

(d) Present tables 1 and 2 on allowable current carrying capacity of conductors in amperes are confusing. Through the proposed simplification a single column replaces present columns 2, 3 and 4 in the tables on pages 301 and 302.

(e) The current ratings in the new column for sizes 14, 12 and 10 may be read direct for up to nine conductors in conduit, at room temperature.



OLD TIMERS honored with Golden Jubilee certificates for fifty years service in the electrical industry at the annual meeting of the Minnesota Electrical Council, Henry B. Kline, Winona; A. R. Clark, St. Paul; Louis E. Chappuis, Faribault; J. C. Bong, Litchfield; and Carl G. Nimis, St. Paul.

DON'T BE PUZZLED!

HERE ARE SIMPLE FACTS ABOUT WIRE DESIGNATIONS IN THE NEW N. E. CODE



For greater flexibility and increased safety of electrical installations in conformity with modern electrical service standards are now possible because of the recognition and approval of new grades of building wire by the National Electrical Code in its 1940 Edition.

Select the grades you need from this list:

○ **HAZACODE Type R**—(Rubber-insulated. Limited to 50° C. operation) meets all requirements for "code" wire installations.

○ **HAZARD WATERTITE Type RW**—(Rubber-insulated, Water-resistant. Limited to 50° C. operation) Approved for use in wet locations where it formerly was necessary to use lead covered wire.

You can often make Large Savings with this Wire

○ **HAZARD PERFORMANCE Type RP**—(Rubber-insulated Performance grade—similar to former 30% grade. Permitted for operation at 60° C.) The higher operating temperature permits heavier current loadings or allows use of a smaller size conductor for a given loading.

This Wire will Save Copper on many jobs

○ **HAZARD PERFORMITE Type RH**—(Rubber-insulated, Heat-resistant. A new grade permitted for 75° C. operation) Has been used on a large scale under Federal Government Specs. J-C-106 and J-C-121. Permitted for general use—Higher operating temperature permits greater current loading or makes possible use of smaller conductors for same loading. Superior qualities make it advisable to select this wire for a wide range of normal uses and for hot locations, boiler rooms, steam tunnels, etc.

Performite should be used on all jobs of a Permanent Nature

○ **HAZARD PERFORMITE Type RHT**—(Rubber-insulated, Heat-resistant, Thin Wall) Also approved for 75° C. operating temperature in sizes 14-8 inclusive. Type RHT has a smaller diameter than code wires. Approved for new wiring or rewiring.

See Code Tables for Copper Saving Possibilities

○ **HAZAKROME TYPE SN** (SN—Synthetic Insulation—a new grade. Approved for rewiring in existing raceways only) Hazakrome is non-inflammable, has long life, is heat, moisture, chemical and oil resistant. Is much smaller in diameter than comparable code grades. Solves many problems concerned with modernizing electrical facilities inexpensively.


Hazakrome can open a huge Rewiring market for you

The Hazard line of building wires manufactured in accordance with the new code standards makes it possible for architect or contractor to "Specify Hazard" in any of these grades in full assurance of obtaining wires that satisfy the particular installation requirements for which they are designed and approved.

For complete information regarding the right Hazard wire for any installation write to

HAZARD INSULATED WIRE WORKS
Division of the Okonite Co.

Wilkes-Barre, Pa.
Offices in principal cities

SPECIFY HAZARD

Building Wires

(f) When the ambient temperature reads 50° C. (122° F.), Type R wire current values fall to 0, and the wire is useless. Therefore, correction values are only applicable for ambient temperatures of 40° C. and 45° C., respectively.

(g) The proposal revises tables 4, 5, 6, 7, 9, 10, 11, 13, 14, 15, 16 and 20.

The proposed plan, according to Mr. Andrae, will eliminate five types of wire, replacing them by a single new type small diameter wire, meeting all the requirements of existing standards for minimizing electrical fire hazards, thereby simplifying the Code. Ordinary wiring practices do not contemplate long time heavy loading of conductors, so that the new current loading table is based on intermittent or average conditions instead of continuous loading. The new smaller diameter wire has a better quality of insulation than has been used heretofore for Code grade, Type R wire, thus benefiting the entire industry. As a result, the current values in the new proposal are changed from the present confusing 1940 edition Code tables to a simple statement of values identical with those shown in the 1937 National Electrical Code and previous issues.

MICHIGAN CONTRACTORS MEET IN MUSKEGON

The Wolverine State Electrical Contractors Association held its fourth annual convention in Muskegon, Mich., April



TENNESSEE CONTRACTORS chose these fellow members to guide the affairs of the Tennessee Electrical Contractors' Association for this year (Left to right) Philip Sweet, Chattanooga, secretary-treasurer; C. R. Wright, Knoxville, new president; Herbert Haile, Chattanooga, first vice-president; A. J. Thompson, Memphis, retiring president and new member of the board of directors; and A. C. Gross, Memphis, third vice-president. Ray Edenfield, Nashville, second vice-president is not present.

18-19. Over 200 Michigan electrical contractors and guests attended.

An important feature of the program was a review of new developments in light sources presented by Ted Brown of General Electric, Lamp Division. "Lighting cost depends on four factors," he said, "cost of lamps and fixtures, labor cost of lamp replacement, current cost and rate of amortization." But greatest economy is not always the deciding factor, he continued, quoting an analysis of defense plant lighting showing that 400-watt mercury vapor lamps proved the cheapest, yet fluorescent units were more extensively

used. Rapidly growing applications of lamps in paint drying, heating and in protective lighting are especially important to the contractor today, he said.

The Board of Governors meeting discussed legislation pending in the Michigan legislature, concerning electrical contractor licensing, and elected new officers for 1941. The officers chosen were, president, Arthur Van Vliet, Detroit; first vice president, F. J. Groleau, Muskegon; second vice president, W. G. Apps, Roseville and treasurer Ed Baker, Cass City. The secretary will be appointed by the president from the Detroit area. C. C. Cadwallader, Detroit; W. G. Campbell, Grand Rapids and L. L. Lambe, Edmore, were elected to the executive committee.



"Mighty thoughtful of you, Mr. Jason, but it isn't necessary to rip off the sheathing for a rewiring job."

FLORIDA ASSOCIATION MEETS AT TAMPA

The Florida Association of Electrical Contractors and Dealers held its annual convention at the Tampa Terrace Hotel in Tampa on April 7th and 8th. Nearly 150 electrical contractors and representatives of other branches of the industry registered for the convention. Over 200 attended the annual banquet of the Association on the first evening.

Some of the speakers who addressed the convention were Frank G. Gannon, President of the Tampa Electric Company; Laurence W. Davis, General Manager of NECA; Maj. M. J. Mackler, Executive Director of the Housing Authority of the City of Tampa; R. B. Roberts, General Sales Manager, Florida Power & Light Company, Orlando; Ellis Knox, Chief Electrical Inspector, Miami; Harper Davidson, Florida Power & Light Company; J. Montenegro, Florida Institute of Accounts; H. J. Chanon and D. B. Clark of General Electric Company, and E. C. Range of the Westinghouse Company.

At the closing business session R. C.

Bigby of Tampa was elected Secretary for the ensuing year in addition to his duties as Treasurer. President W. O. Henderson of Jacksonville, and Vice-President W. S. Monroe of Tampa continue in office for the coming year.

JOHN SCHUMACHER DEAD

John H. Schumacher, one of the best known electrical contractors of our neighbor nation, died on April first in Winnipeg. He was sixty-one years old. He was an American by birth but had long been identified with progress in electrical construction in the Dominion.

Mr. Schumacher, known affectionately as "Schuie" by his many friends, was born in Dubuque, Iowa, went to the University of Minnesota and entered the electrical



John Schumacher

business in Minneapolis in 1903. He went to Winnipeg in 1911 to become manager of the Mitchell, Gray Electric Company. There he later became head of the contracting firm of Schumacher-Mackenzie, Ltd. For the past 16 years, Mr. Schumacher has been a member of the Executive Committee of the National Electrical Contractors Association, representing western Canada. He retired from active work some time ago but continued to be very actively interested in all that concerns electrical progress, and traveled widely in the United States where he is known to contractors in many cities.

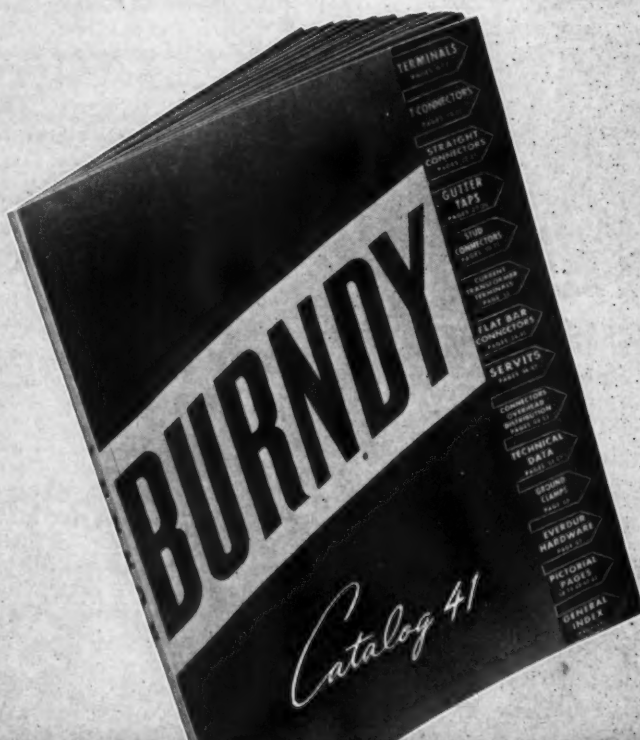
FLUORESCENT SCHOOL IN NEW YORK

An average audience of more than 300 representatives of all branches of the electrical industry attended a five-session fluorescent lighting school held at the Electrical and Gas Association of New York, Inc., auditorium on March 31, April 8, 17, 24 and May 2. It was sponsored by the Educational and Lighting Fixture Committees of that organization and designed to give a comprehensive



BURNDY

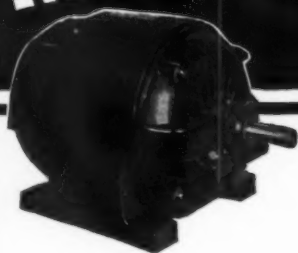
YOU ARE WELCOME TO A COPY OF CATALOG 41 ON
BURNDY ELECTRICAL CONNECTORS. WRITE FOR ONE TODAY.



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SEE YOUR WHOLESALE ON BURNDY CONNECTORS

Peerless MOTORS



USE Peerless Motors on replacement jobs. They are built to stand the gaff—to give long, trouble-free service—to stand up under that extra load which a motor must deliver at times. Use them, too, on all initial installations. They do much to build up customer good will—to contribute towards your reputation as a shop that does dependable work which stands up in service. Write for literature, prices and discounts.

Quick Deliveries



PEERLESS EXHAUST FANS Help Speed-Up Production

TODAY'S need in industry for maximum production demands adequate ventilation to keep workmen fresh, keen and alert. Investigate the effectiveness and dependability of Peerless Exhaust Fans for this purpose. You can make money with them. Write for the Peerless Exhaust Fan Bulletin.

THE *Peerless* ELECTRIC CO.
WARREN, OHIO

In the News

[FROM PAGE 99]

picture of the design, characteristics, application and installation of fluorescent light sources.

The program included five lectures by the following experts in their respective fields of fluorescent lighting: E. W. Beggs, Westinghouse Electric and Manufacturing Co., who discussed "Characteristics of Electric Discharge Light Sources" with emphasis on practical operating data; W. S. Hill, General Electric Co., who covered "Auxiliary Apparatus" and trouble shooting; Karl Staley, General Electric Co., who discussed Commercial Fluorescent Lighting; R. W. McKinley, Westinghouse Electric and Manufacturing Co., who spoke about Industrial Fluorescent Lighting. J. D. Lynett, supervising chief electrical inspector of the City of New York discussed the Electrical and Mechanical Requirements of Fluorescent Fixtures.

Each lecture period was followed by a question and answer period with the final after-lecture session taking the form of an "Information Please" period with experts answering all questions.

COMING MEETINGS

National Electrical Manufacturers Association—Spring Conference, The Homestead, Hot Springs, Va., May 11-15.

National Electrical Wholesalers Association—The Homestead, Hot Springs, Va., May 18-22.

National Industrial Service Association—Annual Convention, Hotel Statler, Buffalo, N. Y., May 19-21.

New York State Association of Electrical Contractors & Dealers—Saranac Inn, Saranac N. Y., July 7-10.

National Electrical Contractors Association—Annual Convention, Rice Hotel, Houston, Texas, Oct. 6-8.

National Electrical Manufacturers Association—Annual Meeting, Waldorf-Astoria Hotel, New York, N. Y., Oct. 27-31.

VIRGINIA GROUP GETS FIELD MAN

The Virginia Electrical Contractors Association, Inc., enjoyed good attendance and an interesting program at its annual meeting recently held at Lynchburg, Va. Guest speakers were Ralph Bouligny, former president and Dwight Casey, field representative of the North Carolina Electrical Contractors Association, who gave an interesting picture of their association's activities.

The future plans of the Virginia Association include a state licensing program, which is rapidly gaining momentum, and a drive for contractor cooperation throughout the state. To gain this end, M. W. Scarborough of Roanoke was appointed as field representative to travel the state and organize and coordinate local con-

BADGER

Synchronous ELECTRIC TIME SWITCHES



CONTRACTORS LIKE THEM BECAUSE:
they are dependable and easy to install

USERS LIKE THEM BECAUSE:
of economical operation and low cost

The Badger line of Time Switches is always in demand by Contractors who want dependability, accuracy, and the right type for a specific need. They know from experience that this is the line that gives them successful, profitable installations. They know when they install Badger Synchronous Electric Time Switches for their customers they are giving them complete satisfaction—accurate timing, economical operation, dependable service. You can't go wrong on Badger. Write for more particulars or see your Wholesaler.

RELIANCE AUTOMATIC LIGHTING COMPANY
1937 MEAD STREET RACINE, WISCONSIN

Monarch
Your Best
Choice for—

MON-O-LAG RENEWABLE FUSES



● Quality workmanship and materials identify all Monarch Fuses. Of simple but sturdy construction, it's easy and quick to renew. Completely approved in all sizes and both voltages.

Monarch renewable fuses comply with Federal Specifications.

Monarch
FUSE COMPANY, INC.
JAMESTOWN, NEW YORK

tractor groups. Wholehearted support of the licensing program was promised the contractors by J. M. Murphy of Roanoke, chairman of the Virginia Chapter I.A.E.I.

The following are the new officers elected for the coming year: W. A. Rice, Lynchburg, president; C. C. Coon, Roanoke, vice-president; T. W. Wilmer, Richmond, treasurer; and L. T. Fraker, Richmond, secretary.

BUFFALO CODE SCHOOL

The Electrical Association of the Niagara Frontier is sponsoring a Code School for electrical men in the Buffalo area which is drawing upwards of 300 at sessions in the Niagara Frontier Civic Club. Co-operating with the Wiring Committee of the Electrical Association in conducting the school are Associated Electrical Contractors, Inc., Niagara Frontier Electrical Contractors, Inc., Electrical Workers Local No. 41, City Electrical Board and Inspection Department and the New York Fire Insurance Rating Organization.

The Code School consists of five sessions with authorities on various phases of the industry addressing each session. The schedule of meetings follows:

Victor H. Tousley, N.F.P.A., Chicago, "The Wires"; C. H. Bissell, Crouse-Hinds Co., Syracuse, "Hazardous Locations"; N. R. Wilson, Buffalo electrical engineer, "Wiring Design and Protection"; H. H. Weber, U. S. Rubber Co., New York, "Wiring Methods and Materials"; Henry A. Morton, Detroit Edison Co., Detroit, "Motors and Controllers."

Each session is divided into two parts. First, the lecture, and second, a question and answer period. To stimulate attendance at the lectures, no charge is made for the five lectures if at least four of them are attended. The registrant pays \$2 the opening night and receives a strip of 5 tickets. When 4 are turned in, the \$2 is refunded.



DOWN MOBILE WAY the popular Siglers are celebrating 21 years of successful electrical contracting. The Sigler Electric Co. was formed in January 1920 and has occupied the same location in downtown Mobile, Alabama, since. M. C. Sigler, left, handles the active appliance business and F. L. Sigler, right, the wiring contracts.

Electrical Contracting, May 1941

NO WAITING FOR FLEX-A-POWER COST SAVINGS



MANY a plant operator would be glad to pay a premium for the advantages FLEX-A-POWER offers . . . for "hang-up-and-plug-in" **SPEED** in installation . . . for **FLEXIBILITY** in installing or relocating machine units . . . for ability to complete electrical hook-ups in a matter of minutes rather than days . . . for a "panelboard running the length of his plant", that is completely **SALVABLE** if facilities must be extended or curtailed later on.

Yes, indeed, advantages like these are worth money today . . . but the big news is that you *don't* have to wait for FLEX-A-POWER savings. In the great majority of installations, FLEX-A-POWER actually costs less to **INSTALL** than conventional plant wiring.

COSTS LESS . . . GOES IN FASTER . . . SAVES TIME and money ever after! These are provable claims you should look into without delay. Write for detailed Trumbullaids Bulletin No. 408.

ESTABLISHED 1909

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ELEC. MFG. CO.

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TRUMBULLIST

KEEP Alert ELECTRICALLY
 use your **TRUMBULLAIDS**

NEW YORK - PHILADELPHIA - BOSTON - CHICAGO - DETROIT - HONOLULU, H. - ATLANTA - NASHVILLE - LOS ANGELES - SAN FRANCISCO - SEATTLE

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YOU GET ALL THREE with a BLACKHAWK Pipe Bender



Blackhawk Benders do MORE than bend pipe. They include a Porto-Power Hydraulic Unit that can be used separately from the bending attachments. Here is the triple utility:

1 PIPE BENDING

Smooth, remotely controlled hydraulic power bends rigid conduit and pipe up to 4" diameter. Saves need for elbows and couplings and otherwise necessary cutting and threading.

2 MAINTENANCE AND PRODUCTION

Big range of attachments adapt the hydraulic unit to push, pull, bend, press, spread and clamp work. Pull gears and pulleys, lift machinery, (as shown at left)—do scores of other jobs allied to pipe bending.



3 SPECIAL JACK

Compact 10 or 20-ton ram (same as used in pipe bending) works in all directions — and at any angle. Preferred to all other types of jacks.

MAIL COUPON TODAY

BLACKHAWK MFG. COMPANY
Dept. P2051, Milwaukee, Wis.

Send Full Information on your Pipe Benders.

Name.....

Company.....

Address.....

In the News

[FROM PAGE 10]

EET SALES CONFERENCE IN CHICAGO

A two year case study of commercial building rewiring in San Francisco and a nine point program for fluorescent lighting development, presented before the eighth annual sales conference of the Edison Electric Institute at Chicago on April 3, marked two all-industry opportunities awaiting cooperative planning and promotion on a nation-wide scale. The challenges, presented by O. R. Doerr of the California Electrical Bureau, San Francisco, and P. H. Powers, vice president of West Penn Power Co., Pittsburgh, respectively, were part of an extensive review of utility sales methods and problems. The program included a power sales conference, jointly sponsored by the EEI and the Great Lakes Power Club, rural sales, lighting sales and home service sections.

"If every home built in San Francisco were wired to A-W standards, it would produce \$40,000 to \$50,000 additional business in a year," said O. R. Doerr. "In commercial rewiring we have signed up \$648,000 worth of business in two years." With this comparison he urged other cities to carry on a similar drive to modernize the electrical wiring and lighting of their commercial districts. This activity, he said, will be especially important when national defense demands are relaxed.

The record of \$648,000 worth of rewiring business was accomplished between April 1939 and March 1941 in a potential market of 177 buildings. Where ordinary wiring was 1 watt per square foot, present levels are as high as 8 watts per square foot. The distribution of business over labor and the major material items gave the following breakdown: labor, 27.2 per cent; conduit, 15 1/2 per cent; wire 14.3 per cent; boxes and fittings 13-14 per cent; switchboard, 9 per cent; panels, 7.7 per cent and fixtures and lamps, 40.4 per cent.

Urging the utilities to organize a co-ordinated program to promote fluorescent lighting, P. H. Powers warned that customers are buying fluorescent equipment on gadget appeal and power-bill-saving sales talk. "Fluorescent lighting is being bought, not sold," he said, "and the facts about lighting are not reaching the buyer. And 95 per cent of fluorescent jobs are going in without engineering help."

Asking the utilities to take the offensive, he set before the conference a nine point program.

1. Find out where and what kind of jobs are being sold.
2. Use fluorescent lighting as a sales tool to reach higher illumination levels.
3. Make sales operations encourage good installations.
4. Encourage and cooperate with the legitimate lighting dealers.
5. Plan an intelligent advertising and information program.

PROFITABLE Opportunities for you with AUTOMATIC TIME CLOCKS

Window Lights . . . Electric and Gaseous Tube Signs . . . Apartment and Hotel Hall Lights . . . Billboards . . . Flood Lighting . . . Poultry House Lighting . . . Linotype Machines . . . Pumps and Motors . . . Electric Refrigerator Defrosting . . . Time Lock Safes and Vaults . . . Street Lighting Systems . . . Traffic Signals . . . Signal and Alarm Systems . . . Appliance Outlets . . . Water Softening Equipment . . . Advertising Displays . . . Ventilating Systems . . . Attic and Exhaust Fans . . . Electric Fountains . . . Air Conditioning Equipment . . . Electric Hot Water Heaters . . . Compressors . . . Oil Well Pumps . . . Battery Charging . . . Sprinkling Systems . . . Airport Lighting . . . Church Bulletin Boards . . . Dramas . . . Coal Stokers . . . Time Signals . . . Chemiculture . . . Paint Agitators . . . Blowers . . . Yard Lighting Systems . . . Bulletin Boards . . . Heat Treating . . . Panoramas . . . Conveyors . . . Suburban Railway Station Platforms . . . Chime Systems . . . Electric Cookers . . . Factory Lighting . . . Electric Glue Pots . . . Park and Playground Lights . . . Gas and Oil Heating Equipment . . . Plastic Molding . . . Solenoid Valves . . . Greenhouse Lights.

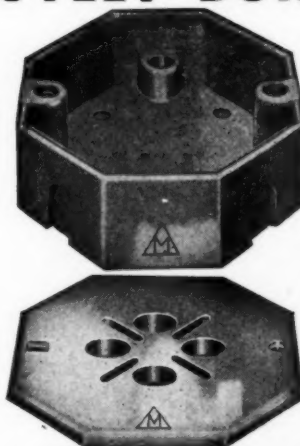
Write for Information
and Discounts

AUTOMATIC
Electric Manufacturing Co.

TIME SWITCHES—FLASHERS

MANKATO • MINNESOTA

Profit by USING ILLINOIS Dependable Porcelain OUTLET BOXES



* Glazed and unglazed styles conforming to all existing standards of dimensions, spacing, position of knockout holes, and mounting screws. High mechanical and electrical efficiency.

Contractors who use these products not only establish themselves most securely with their customers but also build their business by making each job a true quality one. Send for bulletin.

ILLINOIS ELECTRIC PORCELAIN CO.
MACOMB, ILL.

6. Educate own sales force and dealers sales people by fluorescent lighting conferences.

7. Obtain key jobs in strategic spots as high quality examples.

8. Use fluorescent lighting on own property.

9. Sell light levels and foot-candles instead of watts.

NEW APPOINTMENTS ON LICENSE BOARD

T. L. Rosenberg, representing northern California and J. O. Case, representing southern California, have been appointed on the examination committee of the California state contractors license board by chairman Roy Butcher to prepare examination procedure for applicants for electrical contracting licenses in that state. Rosenberg, head of T. L. Rosenberg Electric Co., Oakland, is a member of the Oakland city examining board, as J. O. Case, president of Quality Electric Co., Los Angeles, is of the Los Angeles County board.

STEINMETZ HEADS B.L.-B.S. BUREAU

H. P. J. Steinmetz, vice-president, Public Service Electric & Gas Co., Newark, N. J., was elected for a two-year term as Chairman of the National Better Light-Better Sight Bureau at a recent meeting of the Bureau's Executive Committee.

Mr. Steinmetz, who has long been deeply interested in lighting promotion, brings to the Better Light-Better Sight movement a thoroughness and energetic leadership that has characterized his activities as head of all sales and promotional work in his company.



TWENTIETH ANNIVERSARY in the electrical contracting business is being celebrated by L. H. Beaulac, president of the Eastern Electric Engineering Co., Pawtucket, R. I. He is rounding out his thirty-seventh year as a member of the electrical industry.

Electrical Contracting, May 1941



"We want *Correct Lighting*
—not bargains in fixtures!"

● That's right, Mister! And your electrical contractor will agree with you! When lighting fixtures are designed right, built right, installed right—they'll stay right! And they'll keep right on delivering the high quality illumination that you originally bought!

That's why Goodrich fluorescent fixtures are finished in permanent porcelain enamel . . . why they are made in accordance with R. L. M. standards . . . why they use certified ballast equipment . . . and bear underwriter's approval. These safeguards are your protection. They're important. Be sure to have them!

The Goodrich line covers the complete range of industrial lighting fixtures. Literature is available on all Goodrich fixtures.

GOODRICH INDUSTRIAL LIGHTING

FLUORESCENT FIXTURES—available in a complete line
to provide high intensities for general illumination.



SOLD ONLY THROUGH ELECTRICAL WHOLESALERS

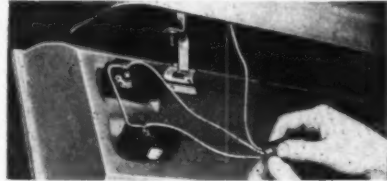
GOODRICH
ELECTRIC COMPANY
OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES AND FACTORY: 4602 BELLE PLAINE AVENUE, CHICAGO, ILL.

Meet Contract Dates —Speed Up Profits with **IDEAL**



Solderless—Tapeless—Wire Connectors



For better, lower cost wiring and installation of Fixtures, Fluorescent Lights, Appliances, Machinery, etc. because—

- No solder—No tape—No blow torch.
- Easy to use—make craftsmanlike job.
- Sizes for all common wire joints.
- Better electrically—stronger mechanically.
- Fully approved: listed by Underwriters' Laboratories, Inc.
- SAFER—Pass inspection quickly.

MILLIONS IN USE!

WRITE FOR FREE SAMPLES



Fish Tape, REEL and PULLER

- Prevents tape breakage.
- Keeps fish tape under control.
- Complete with 50 ft. $\frac{1}{4}$ " x .045" tape.

PRICE—Only \$1.50

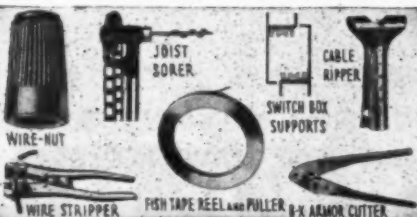


SAFE! Tests electrical and radio circuits, motors, fuses, etc. from 80 to 550 volts, A.C. or D.C.



- Pocket size. Inexpensive.
- Cuts armor from 2 or 3 wire No. 12 or No. 14 BX in one operation.
- No more nicked insulation, shorts or wasted BX.

Other Ideal Cost Reducers



IDEAL SOLD THROUGH JOBBERS

Ideal Commutator Dresser Company
1041 Park Avenue Sycamore, Illinois
Sales Offices in All Principal Cities

In the News

[FROM PAGE 103]

R. I. LICENSE BILL AWAITS STATE ACTION

A state licensing bill, sponsored by the Rhode Island Electrical Contractors' Association, was recently introduced in the State Legislature and is now awaiting consideration of the finance committee. The bill proposes state licensing of all electrical contractors and electricians doing electrical construction work and is designed to increase the quality of workmanship and safeguard the public interests.

SOUTH BEND A.W. CERTIFIES

The recently organized Adequate Wiring Bureau of South Bend, Indiana, forty-eighth group to undertake this national promotion, has just received its certification license from the National Bureau. The license covers the city of South Bend and St. Joseph County, Indiana.

Thomas Beverage and Russell Place are the contractor members of the local bureau's Standards Committee. Other members include Fred Champaigne, city inspector; Frank Kilander, jobber; and John Webb, secretary of the bureau.

—WITH THE—
Manufacturers

Graybar Elect Officers

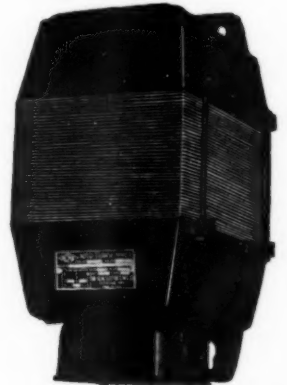
The Board of Directors of Graybar Electric Company re-elected Frank A. Ketcham as president. Elbert A. Hawkins, who has been vice-president in charge of sales, was elected senior vice-president. Alfred H. Nicoll was re-elected vice-president.

Three district managers were elected vice-presidents—Walter P. Hoagland of Chicago, Walter J. Drury of New York and Alfred L. Hallstrom of Philadelphia. They will continue their headquarters in those cities.

Elmer W. Shepard was re-elected treasurer and Martin E. Wagner was continued as secretary and comptroller.

United States Rubber Company announces the appointment of J. C. Bird as sales representative for its electrical wire and cable division in the Seattle district. Mr. Bird's organization will be known as Electric Agencies, and will be located at 2207 First Avenue South, Seattle, Wash.

NEW WAY TO SAVE OVERHEAD EXPENSE



The connection of Acme Air-Cooled Transformers to the 220 or 440 volt power circuit provides for 110 volt lighting circuits where needed, thus saving separate metering for power and lighting loads and installation of two complete wiring systems. You can sell this economy idea to plant managers. Write for Bulletins 147 and 152.

THE ACME ELECTRIC & MFG. CO.
36 WATER STREET • CUBA, NEW YORK

Acme Electric
TRANSFORMERS

HERWIG FIXTURES

are easy to sell as they are in demand for all kinds of buildings and are specified by leading Architects and United States Government.

OVER THIRTY YEARS' EXPERIENCE

OUT-DOOR LIGHTING FIXTURES

Apartment Buildings
Public Buildings
Bungalows
Churches
Schools
Garages
Country Clubs
Warehouses
Residences

A FIXTURE FOR EVERY OUTDOOR PURPOSE

Send for our
CATALOGUE NO. 40
with **NEW SUPPLEMENT**
and **REVISED PRICE LIST**
200 Illustrations

The
Herwig Company
MANUFACTURERS
Established 1908
1753-59 Sedgwick Street
Chicago, Illinois, U. S. A.

Okonite Changes

At the annual stockholders meeting, Leland B. Duer, partner in the law firm of Duer & Taylor of New York City, was elected a director of the Okonite Company.

Charles E. Brown, Jr., formerly assistant to the president, was elected vice-president of The Okonite Company and the Okonite-Callender Cable Co. Mr. Brown who has been associated with the company's sales department since 1925, will remain in charge of the Washington, D. C., office.

Albert F. Metz, treasurer of both companies was elected a director of the Okonite-Callender Cable Co.

John C. Dolph Company, Newark, N. J. announces the appointment of James A. Moran as advertising and sales promotion manager. Mr. Moran was formerly with the advertising agency of Campbell-Ewald Company of New York. He succeeds Charles V. Allen, who has resigned to join the sales staff of Robert McKeown Company of Newark.

Westinghouse Electric and Manufacturing Company announces the appointment of Edward C. Stoeber as manager of the agency and specialties division of the Northwestern District. Mr. Stoeber will take up his new duties in Chicago after two years as manager of the Westinghouse Duluth Minn., office.

Cutler-Hammer, Inc. has transferred A. M. Wolf from the Detroit office to the St. Louis office.

Johns-Manville Sales Corporation, New York, appointed G. A. Barker as manager of Johns-Manville's public utility and electrical products department.

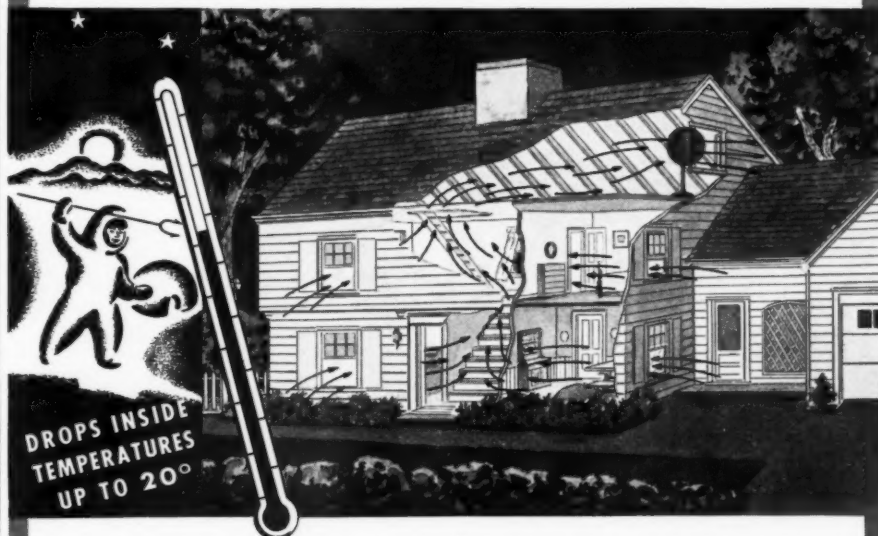
Chicago Pneumatic Tool Company, New York, has engaged the services of James P. Gillies to assist in general sales activities.

Roller-Smith Company, Bethlehem, Pa., has appointed Paul Helms as purchasing agent. He succeeds Harry A. Cassler, who retired on April 1.

Allis-Chalmers Manufacturing Co., Milwaukee, has appointed Lee H. Hill, a transformer engineer, as assistant manager of the company's electrical department.

Carlton B. Smith, formerly district service engineer in the Southeast District, has been promoted to district superintendent of service and erection, with headquarters in the Healey Building at Atlanta, Ga.

Sell
"SHADE-TREE"
Comfort
THIS SUMMER!



ILG NIGHT COOLING FOR HOUSES AND APARTMENTS



NATIONALLY
TIME
ADVERTISED

PORTABLE Models for
plug-in use in attic or
any convenient window.

BUILT-IN Models for
permanent installations
in attics.

Here's your newest money-maker . . . a cooling system that *every* home can afford . . . powerful smooth-running ILG Fans that *drive out* hot sticky daytime air . . . *draw in* cool refreshing nighttime air . . . dropping inside temperatures up to 20 degrees! Plugged-in in attic or any convenient window, overnight trial demonstrations sell even the most doubtful prospects! An amazing opportunity for the coming Summer . . . if you act now! Write for the whole story.

ILG ELECTRIC VENTILATING CO.
2879 N. CRAWFORD AVENUE, CHICAGO, ILL.
Offices in 43 Principal Cities



Vitalized
VENTILATION
AND AIR CONDITIONING

*AIR CHANGE...NOT JUST AIR MOVEMENT!

KLEINS... FOR THE MAN WHO KNOWS PLIERS



"Since 1857"

ASK the old timer who has been up on the sticks since the turn of the century. Ask the grunt who wants to be up there, too. Ask any lineman or electrician anywhere—he'll tell you that only one kind of plier is good enough for him—the kind that carries the Klein trademark. Such universal recognition of quality by men who know is what has made the name Klein first in electricians' tools "since 1857."



Your copy of the Klein Pocket Tool Guide will be sent on request.

ASK YOUR SUPPLIER

Foreign Distributor:

International Standard Electric Corp., New York



More Gossip

For the Carriage Trade

Martin Wright Electric Co. in San Antonio, does big construction work. But they also sell fixtures and appliances to the "carriage trade." So they have a store and office building for themselves that probably takes the beauty prize for the industry. It combines Mission and Aztec in architectural treatment and decoration and leaves a stranger gasping. But San Antonio has the setting for it.



BACK IN HARNESS after an extended rest, William H. Ireland, president of Wm. H. Ireland & Co., Providence, R. I. electrical contractors, pores over his firm's records. Bill is glad to be up-and-at- em again.

Lighting Our "Venice"

Fred Loth, of Graham and Collins, is the man responsible for San Antonio's night river scenery. The San Jacinto River crosses the main street seven times, just back and forth. The banks are planted in palms, bananas and other tropical foliage. It is now lighted from hidden units that flood the trees and bridges. F. A. Covington of "Public Service" planned the project. Loth installed it in this "American Venice"—as they call it.

Small Diameter Work

Flynn Electric, of Bridgeport, Conn., has been trying out the new small diameter wire—and likes it. They have tried it in an old one story group apartment house unit taken on by the Bridgeport Housing Authority. They used it on the feeders from the service switch to distribution panels, breaking up branch circuits to put more capacity in each. Flynn is now after some commercial buildings for similar rejuvenation work.



WOLVERINE SOLDERING LUGS

- **High-Conductivity**
- **Square-End**
- **Uniform Dimensions**

BUY FROM YOUR JOBBER



WOLVERINE TUBE CO.
DETROIT, MICHIGAN

MINERALLAC HANGER



Conduit $\frac{3}{8}$ "— $2\frac{1}{2}$ "
Cable to $2\frac{1}{8}$ " (with Bushings)

**Cadmium and Everdur
MINERALLAC JIFFY CLIP**



Sizes from .250" O.D. Tubing
to $1\frac{1}{4}$ " conduit.

See your Jobber

New York City Office
Theodore B. Dally
50 Church Street

MINERALLAC ELECTRIC CO.
25 N. Peoria St., CHICAGO

Maintenance Scale

T. J. Cook of Palisades Electric Company in Yonkers, N. Y., sees a big and profitable market for maintenance and repair business waiting for the day when the union will provide a lower scale for this work. It will give employment to a lot of good workmen who are not as young as they once were, he says and added business for the contractor not salable at the high cost of the standard wage.



HEAVY CURRENT feeders and breakers, as a result of high level lighting and air conditioning loads in modern office buildings, require good engineering design and expert installation to avoid inductive reactance drop and wasteful heating of bus structure and terminals, says electrical contractor Alan Cooke of Houston, Tex. The breaker shown controls main power for the new addition to the Mellie Esperson Building in Houston.

Fastenings

A recent meeting of the Cook County Electrical Contractors Association spent an evening reviewing one of the small but important phases of installation, fastenings in fire-proof construction.

Consensus—best way to lose dollars is to try to save pennies on shields and anchors.

Important note—select proper size, install correctly and forget pull-out capacity because good anchors will hold beyond the normal capacity of the holding screw anyway.

Too Cheap

Stanley Cameron, who heads the H. P. Foley Company in Philadelphia says that Government projects go too cheap. Four or five per cent seems to be the maximum margin but some contractors are taking work for 3 or 3½, or even 2½. It's not enough for a specialized trade.

AND THEN— *there must be light and power!*



YES, when a new defense plant is completed—kilowatts must be instantly on tap!

And that calls for the best efforts and close cooperation of electric light and power company, consulting engineer, contractor, wholesaler, and electrical product manufacturers.

Although faced with the urgent and ever-increasing demands of not only the Government but of every branch of industry, as well—Roebbling is striving to the very limit of its resources to meet this emergency.

Roebbling plants are operating day and night—at full capacity—to satisfy the unending need for high quality electrical wires and cables.



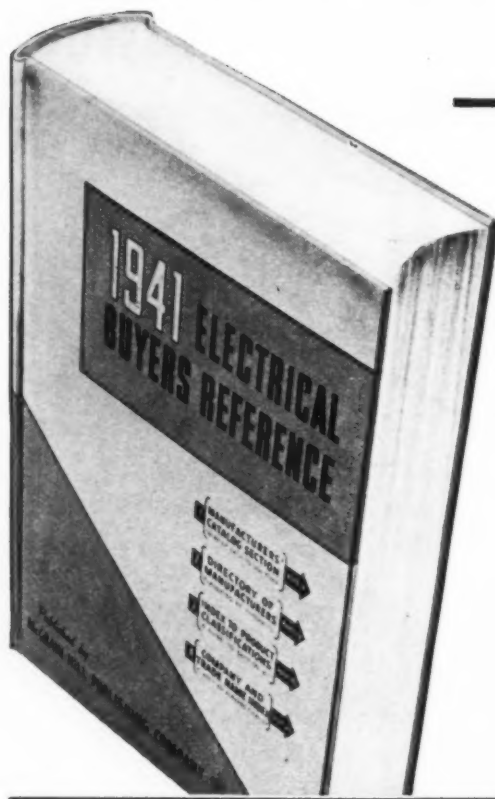
ROEBLING ELECTRICAL WIRES AND CABLES

JOHN A. ROEBLING'S SONS COMPANY

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Branches in Principal Cities Export Division: 19 Rector St., New York, N.Y., U.S.A. Cable Address: "Roebbling's", New York

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More Gossip—

Immortal Numbers

A job material sheet, worked up by Ed Wigdahl of Wigdahl Electric Company, Chicago, lists several hundred items. It is remarkably complete, even to tools and ladders and makes a fine job-order blank and check list.

However, when we saw "11-B" boxes, "Harter" sockets and such we asked why. Answer — these ancient designations of common materials are still so much used by mechanics, generic names or modern catalog numbers would just add confusion.



COMMERCIAL SPECIALIST E. P. Johnson, in addition to being secretary of the firm, handles a large part of the estimating work of E. C. Ernst, Inc., electrical contractors of Washington, D. C. His firm does a majority of the apartment and commercial building work in the Capital City.

Ship Wiring Costs

H. Wilson, of Gulf Electric, New Orleans, is a ship wiring specialist. He keeps up a manual of ship cost data that follows unit methods. It is a mine of experience which he uses in new work. He wonders if other ship specialists are working up similar dope.

Camp Inspector

Leo McCormick, former City Electrician, Kansas City, Mo., is now a supervising inspector at a large government camp under construction at Rolla, Mo. He sees to it that the boys do right by their Uncle Sam.

New Address

The friends and business associates of the J. M. Edgar Electric Co., electrical contractors and appliance dealers of Vernon, B. C., will find them in their new location in the Nolan Building, 10 Wet- ham Street, Vernon.

Gambling Control

Ernie Hedler of the local contractors association in Philadelphia, says that Defense Work is curing a lot of contractors of the bad old habit of gambling on price. They can't take chances now either in labor or material costs—And a good thing, sez Ernie. There's lots of waiting work and a shortage of labor in Philadelphia and plans are afoot for organized apprentice training; the Association cooperating with the union.

New Name

Lynch & Scott Electric Co. will be the new name which the pioneer firm of Edward J. Lynch Electric Co., 2080 Sutter St., San Francisco will now be called. Edward J. Lynch Jr. and Edward W. Scott, long interested in the company as a partner, will continue to operate under the new name.

Government First

Leonce Bonnetaze, of Best Electric, says that both labor and material shortages are worrying them now in New Orleans. The government rounded up a lot of skilled men for Hawaii, the Canal and other outposts and the many southern camps have shortened up available materials. It is sure complicating the business.

Forty Years

John A. Gilliland, estimator for Clapp, Rose and Vaughn, Inc., electrical contractors in Waterbury, Connecticut has just rounded out forty years in the electrical construction business. Congratulations! He has developed his own labor units and says that every contractor should do the same.



SHOP SUPERINTENDENT Joseph J. O'Donnell has his favorite spot in the center of the large motor repair department of the J & H Electric Co., Providence, R. I. From this vantage point he gets the repair work rolling and helps the boys when they run into a snag.

USE GENERAL ELECTRIC RW WIRE

IN PLACE OF LEADED CABLE



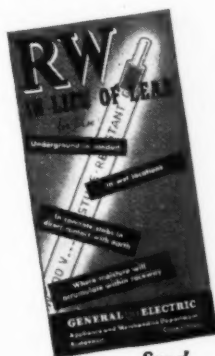
Approved by
Underwriters for
Moist Locations

G-E Type RW moisture-resistant building wire is easier to use than leaded cable and is less expensive. It is approved by the Underwriters' Laboratories for use in raceways in lieu of lead-covered cable as follows:

1. Underground
2. In concrete slabs or masonry in direct contact with the earth
3. In permanently moist locations
4. Where the accumulation and condensation of moisture within the raceway is likely to occur

A special low moisture absorption rate rubber compound is used to insulate this wire. Parts of the rubber which might absorb moisture are removed or neutralized. In other respects the construction of G-E Type RW wire is similar to standard braided building wires.

More conductors may be used in one conduit or duct with this wire; or smaller conduits or ducts may be used.



Send
for this folder

For further information see the nearest G-E Merchandise Distributor or mail the coupon below for a folder containing detailed data on this wire.

General Electric Company
Section W-185
Appliance and Merchandise Dept.
Bridgeport, Conn.

Sirs: Please send me the folder on G-E Type RW Building Wire.

Name.....
Address.....
City..... State.....

GENERAL  ELECTRIC

EQUIPMENT *News*

Multiple-Outlet Plug

An unbreakable all-rubber multiple-outlet plug, cube tap, has been developed. It is capable of withstanding extremely heavy pressure and its construction makes it impossible for any metal parts to become exposed under any conditions, it is claimed. Spring friction blades provide permanently tight connections. The plug is smaller in design and is compact, scratch-proof and sound-proof. Approved by Underwriters Laboratories. United States Rubber Company, Rockefeller Center, New York, N. Y.



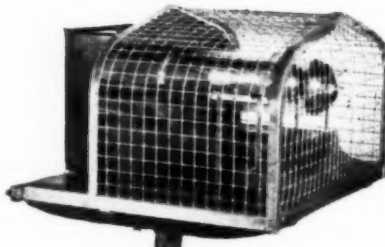
U. S. RUBBER OUTLET PLUG

Drill

This new 1/2-in. standard ball bearing drill is a practical production drill with high power, compactness and light weight. It is equipped with anti-friction bearings, splined gear mounting, locked inner and outer races on spindle bearing, and removable commutator end cover. With close offset and choice of end or side handle, this drill is particularly adapted to aircraft work, with a full range of spindle speeds. Its drilling capacity in steel is 1/2-in. and 3/4-in. in hardwood. Standard speed is 2,000 rpm. and available also in speeds of 3,500 and 5,000 rpm. Black & Decker Mfg. Co., Towson, Md.



BLACK & DECKER DRILL



G-E WIRE MESH GUARD

Wire Mesh Guard

A one-inch mesh wire guard for use on Type M-2 sodium luminaires has been developed. The purpose of this guard is to protect sodium lamp and reflector elements from large flying objects in industrial areas or near railroad sidings. Guard is permanently fastened to unit. Relamping is done through breech-loading device on the end. General Electric Co., Schenectady, N. Y.



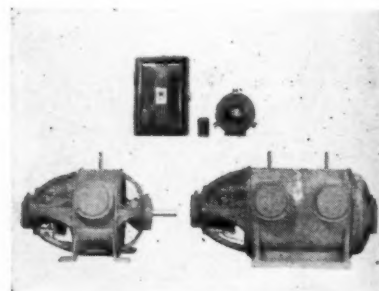
PITTSBURGH PERMAFLECTOR FLOODLIGHT

Floodlight

Floodlight No. AL-11 Series is for long range service, as illuminating of buildings 150 feet distant or more. When equipped with inside stippled or spread type cover glass, unit is useful for recreational areas, gasoline filling stations, amusement parks, automobile parking and used car lots, new homes in subdivisions, outdoor electrical stations, football fields and baseball fields. It uses 750 or 1000 watt lamps. Pittsburgh Reflector Co., Oliver Building, Pittsburgh, Pa.

Adjustable-Speed Drive

Designed for industrial applications requiring adjustable speeds over wide ranges with constant torque, this new 10-to-1 adjustable-speed drive uses a series circuit without usual exciter. It combines high-torque characteristics of d.c. series motor with flat-speed properties of shunt motor. Drive consists of single-unit motor-generator set supplying operating voltage for d.c. series motor coupled to driven load; rheostat in parallel with generator series field to control driving motor speed; across-the-line starter and push button for a.c. motor. Open frames standard; splashproof and totally-enclosed available. Drive available in ratings from 1 to 15 h.p., speed range from 175 to 1750 rpm., 2- or 3-phase, 220- to 550-volts, 60 cycles. Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa.



WESTINGHOUSE SPEED DRIVE

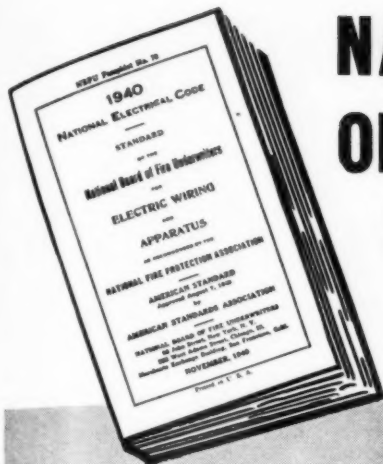
Motor Pulley

This new variable speed pulley has been designed for light, inexpensive machinery. It mounts directly on motor shaft and requires only standard V-belts. Features include short over-hang, forced lubrication, balanced sheave and all metal construction. Both halves of sheave move giving accurate belt alignment at all times. Pulley faces are curved. Speed ratios up to 2 1/2 to 1 available. Sizes up to 3/4 hp. Complete unit includes variable pitch pulley and adjustable sliding motor base. By turning handwheel of base, motor moves backward or forward causing increase or decrease in belt tension. This causes pulley to open and close, changing pitch diameter and driven speeds. Speed changes are made while drive is running. Ideal Commutator Dresser Co., 1041 Park Avenue, Sycamore, Ill.



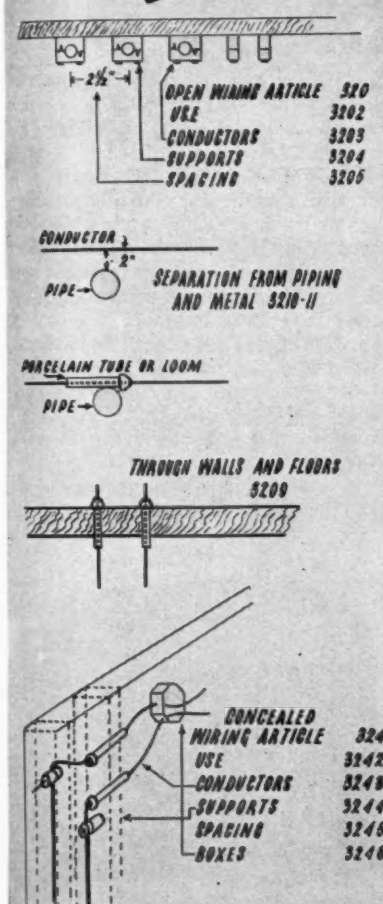
IDEAL "S-O-S" MOTOR PULLEY

Electrical Contracting, May 1941



NATIONAL ELECTRICAL CODE Okays Modern Porcelain Protected Wiring Systems

The Principles Employed in Porcelain Protected Systems Are Covered Specially in the 1941 National Electrical Code Under Articles 320 and 324



★SINCE practically every issue of the National Electrical Code has had rules for installing Porcelain Protected Wiring, it is obvious that through the many years of experience with this type of wiring, contractors know it is not new and yet it is not old. It has kept pace with the need for modernization. The very fact that it is preferred in so many localities is evidence of its durability for construction and building design. In only a very few locations is Porcelain Protected Wiring limited. This is understandable as there are limitations to all types of wiring. Industries, Warehouses, Stores, Homes, Garages and other buildings of frame or fired brick, tile or cement construction come under the type suitable for wiring with Porcelain Protected Wiring. Some

cities have their own ordinances covering the type of wiring within fire zones.

Throughout the years, by virtue of long experience, the Code has provided all the rules necessary for the protection of the conductors and these are found in Articles 320 and 324. They are simple yet they meet every contingency. These rules were built around porcelain as the ideal insulator. They provide for supports and spacing of the conductors. The use of flexible tubing and means for separating wires from metal work as well as protection from mechanical injury are clearly indicated. And now, with porcelain outlet boxes, the system is completely, adequately insulated thus providing Safety all through the system with PERMANENCE.

One Insurance Underwriter stated recently that in his city over 300,000 single family dwellings are wired with Porcelain Protected Wiring and that losses either by fire or accident have been practically NIL. The new homes in that city are being wired by the same method and with the same porcelain protection, to continue this outstanding record of safety.

These homes are wired according to code rules by qualified contractors and in conformity with standards of practice with which these experienced men are familiar. Now, with porcelain outlet boxes, the entrances to the wiring systems can be fully protected from shorts and grounds. These boxes make the system completely short and ground proof. They are non-conductive thereby precluding shorts due to poorly taped wires or fires and accidents due to condensation effect as frequently occurs in kitchens, bathrooms and basements.

Modern Porcelain Protected Wiring System is based on FUNDAMENTAL PRINCIPALS which have long been established practice. New ideas have prevailed for a time, but because none have embodied the basic principles to the same extent as the Porcelain Protected Wiring System, it continues to be the most practical and desirable.

Safe wiring like basic facts cannot be cast aside. The basic elements which make a wiring method substantial in practice as well as in principal are the same as those which determine the values of all other time proven methods of operation. Any wiring method which is overburdened with rules, which must be buttressed with extraneous devices to reduce shorts and grounds cannot be considered fundamental. If it suffers limitation as to the amount

of service it will perform or load it can carry, it is not basic. If it does not reduce the element of chance of human error to a minimum but instead, increases this possibility, it is not based on the time tested, proven factors of safe electrical wiring.

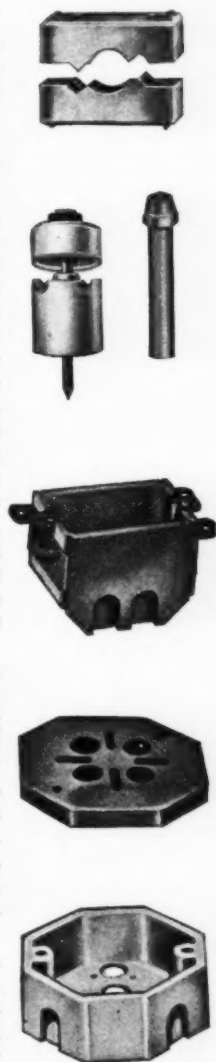
In the case of Modern Porcelain Protected Wiring Systems the spacing of conductors to amply keep them separated and to dissipate any heat from loaded wires, the mounting of the wires on porcelain supports and the insulating of wires from wood members by means of porcelain tubes, all follow the same wise principles which the early code writers held to be paramount in any wiring systems, namely, that all wiring should be so constructed as though the wires were bare.

In view of all this Modern Porcelain Protected Wiring is without a peer as a MAXIMUM STANDARD of wiring, because it provides both maximum current carrying capacity and maximum INSULATION.

Electrical porcelain materials for installation of Modern Porcelain Protected Wiring Systems are manufactured by:

- Porcelain Products, Incorporated, Findlay, Ohio
- Knox Porcelain Corporation, Knoxville, Tenn.
- Illinois Electric Porcelain Company, Macomb, Ill.

and may be obtained through your electrical wholesaler.



ADVERTISEMENT

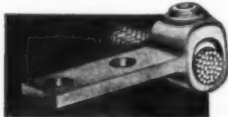
The MOST COMPLETE

LINE OF

Terminal Lugs

THOUSANDS of patterns — you can find the exact lug you want.

Penn-Union E-Z Lugs take a wide range of conductor sizes. Only 5 sizes of lugs for wire and cable from No. 6 to 1,000,000 CM. Self-locking; positive. Re-used over and over.



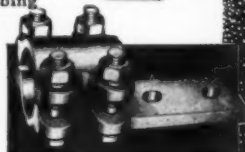
QUICK, SIMPLE INSTALLATION with the popular Penn-Union VI-TITE lug.

Vise-like action gives a sure grip. Made in a wide range of sizes.

Fully approved Soldering Lugs, pressed from pure seamless copper tubing, and annealed. Also cast Heavy-Duty Soldering Terminals—and shrink fit lugs for copper tubing.

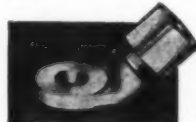
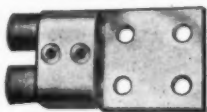


CLAMP TYPE terminals in widest variety. Straight or angle, for cable or tubing, with any desired contact tongue.



SCREW TYPE Solderless, easy to use and universally popular, especially in the small sizes. For both solid and stranded wires.

MULTIPLE CABLE terminals. We can furnish any style lug for two or more conductors.



SLEEVE TYPE terminals, with split contact sleeves, preferred by many large users. Made in many types.

See the Penn-Union Catalog for any kind of Terminal Lug — carefully made, thoroughly tested, Dependable.

Also the most complete line of Cable Taps, Service Connectors, Ground Clamps, Two-Ways, Tees, etc.

Sold by Leading Jobbers

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PENN-UNION
ELECTRIC CORPORATION
ERIE, PA.

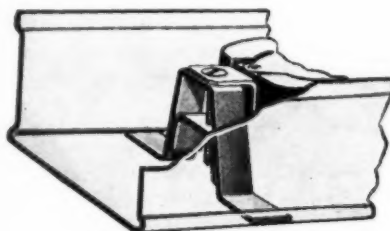
PENN-UNION
Conductor Fittings

EQUIPMENT News

[FROM PAGE 110]

Fittings

A new series of fittings has been developed, making it possible to use standard No. 3000 Wiremold wiring channel as a group circuit feeder raceway for wiring to light and power circuits in factories. Also as an industrial type of multiple outlet system at work benches, etc. for connecting portable tools and appliances. New fittings include No. 3000 W.C. wire clip for holding wires in raceway, No. 3007A mounting strap for use with any standard devices having plaster ears and in combination with standard flush plates. The No. 3046 cover is for fastening 50 amp. Twistlock receptacles. The Wiremold Co., Hartford, Conn.



WIREMOLD FITTINGS

Connector

This Burndy Hottap, Type HET, is suitable for taking taps from either cable or flat bar. It has many applications in industrial plants. It may be used for grounding, temporary taps and jumping equipment being repaired or replaced. The jaws, which grip "hot" conductor, have grooved contacts which are designed to clamp cable, and serrated contacts which may be used to clamp flat bar. On tap, rotatable eye clamping element is used. This permits tap conductor to be connected to Hottap at any angle. Connector can be supplied for any desired sizes of cable or flat bar. Burndy Engineering Co., Inc., 459 East 133rd Street, New York, N. Y.



BURNDY HOTTAP



JIFFYON VISE BRACKET

Vise Bracket

This Jiffyon folding and removable vise bracket is easily attached to floor of truck and can be used for mounting either pipe or machinist's vise. Constructed of steel sections, when in working position it provides rigid support for threading, filing, sawing and other heavy work. Bracket has been designed to reduce working effort by locating vise at convenient height and providing ample room for use of large wrenches, pipe threading tools, pipe cutters. Jiffyon Mfg. Co., 1752 South Taylor Road, Cleveland Heights, Ohio.



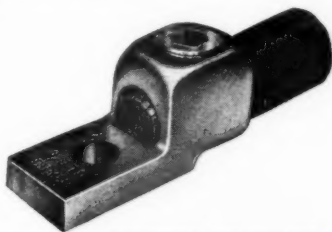
CUTLER-HAMMER CONTROLLER

Controller

Speed up of production is the result claimed for this new line of cam operated, mill duty controllers. Ease of operation with positive feel of all speed positions is obtained by using adjustable compression type of star wheel spring. Available in two speed, three speed and multi-speed types, the controllers are recommended for mill auxiliaries, crane hoist, bridge and trolley applications. Some of the features are vertical contacts, double break, silver to silver; cam shaft operates on ball bearings sealed against dust; easily accessible terminal board; heavy cast case and cover for either separate or bench board mounting. Optional features include spring return; off position latch, two, three, or five speeds. Cutler-Hammer, Inc., Milwaukee, Wis.

Solderless Lugs

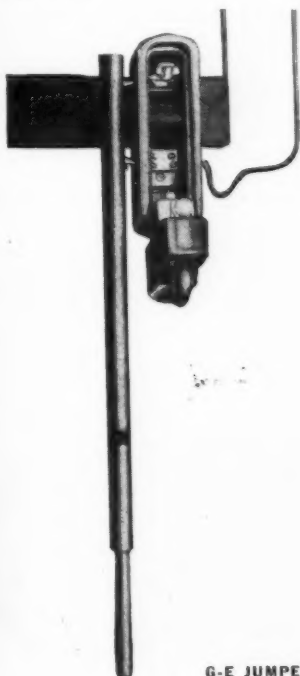
This line of solderless "Handi-Lugs" has been redesigned. Five sizes—30-60, 100, 200, 400 and 600 ampere—cover a range of wire sizes, solid, strand or flexible, from No. 14 to 1,000,000 CM single bolt hole. There are three intermediate sizes available for convenience wherever a more limited range of wire sizes is desired. One of the new features is a through opening so inspection can be made to ascertain that cable is inserted deep enough into lug to make full contact. Trumbull Electric Mfg. Co., Plainville, Conn.



TRUMBULL SOLDERLESS LUGS

Jumper Stick

A jumper stick which permits replacement of the first fuse link in a G-E reclosing cutout without interruption to service has been developed. Device consists of Herkolite tube, housing two bronze, nickel-plated contacts separated by steel compression spring. Contacts are connected by flexible shunt of tinned-copper cable, swaged to contacts, giving a permanent joint. Both contacts project through slot in tube; upper contact is fixed, while lower can be moved up and down in slot. With jumper stick in place, cutout door can be opened without interrupting service, as load current is by-passed through shunt connecting contacts. Jumper fits both 50-ampere and 100-ampere G-E reclosing fuse cutouts. General Electric Co., Schenectady, N. Y.



G-E JUMPER STICK



**LOOK AT ALL THOSE
SWELL SALES FEATURES
PLUS THE ADVANTAGES OF
LINE-O-LAMPS FLEXIBILITY!**

WIREMOLD'S

**NEW
DELUXE
Glass Enclosed
LINE-O-LAMPS**

EYE APPEAL

Modern architecturally correct design. Translucent opal reeded glass. Aluminum finish.

LIGHT APPEAL

High illumination on lighted surfaces, excellent distribution. Opal glass transmits maximum light without glare.

SIMPLICITY APPEAL

Easy to install, easy to clean, easy to re-lamp. No channeling of ceilings needed.

UTILITY APPEAL

Can be used against ceiling, hung from canopies, mounted on walls, in stores, offices, theaters, clubs, public buildings.

plus CONTRACTOR APPEAL . . .
the same basic No. 3000 Wiremold channel, fittings, controls and other equipment used in all LINE-O-LAMPS are used in the New Glass Enclosed Units.

Hence you have complete FLEXIBILITY in layout and installation to meet every demand . . . from a single lamp unit to multiple continuous run installations in large areas. And bear this in mind . . . you work with time-tested, correctly engineered, standard Wiremold Units and parts with which you are thoroughly familiar.

Wiremold engineers . . . Pioneers in the field of Fluorescent Lighting . . . help you assure your customers the best in service and satisfaction. Write at once for advance copy of New Catalog Section now on the press.

THE WIREMOLD COMPANY, HARTFORD, CONN.

Enjoy the Double Advantage of **FLUORESCENT** and **WIREMOLD**

FLOOR BOXES and WIRING SPECIALTIES

No. 284 Duplex Receptacle Nozzle



With 1/2" brass pipe extension. Neatest and most compact fitting obtainable. Also available with 3/4" pipe extension. Fullman also offers Duplex telephone Nozzles.

No. 470 Pipe or Conduit Hanger



Pipe support turns freely, allowing pipe to run parallel or at right angles to beam. Does away with drilling or use of straps. Handles 1/2", 3/4" and 1" size pipe, to steel beams 3/8" thick.

No. 330 "Latrobe" Tom Thumb Utility Outlet



To be used in wood installations and other locations free from moisture or mechanical injury.

• The Latrobe Line is complete for all residential, commercial, and industrial requirements. In addition, the entire line is designed with the idea of reducing installation time . . . an important point to consider when selecting floor boxes and wiring specialties

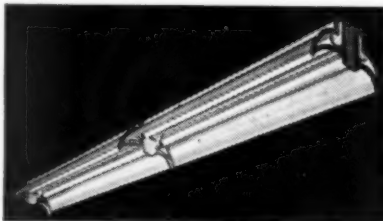
Write for details TODAY!
FULLMAN MFG. CO.
LATROBE • PENNA.

EQUIPMENT *News*

[FROM PAGE 113]

Fluorescent Troffer

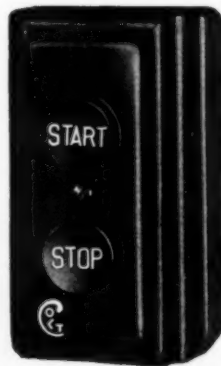
This surface troffer is designed to produce higher levels of fluorescent light. It is for both close ceiling and suspension mountings. Two types of this troffer have the "add-on" feature. "Base" type is supplied with ornate case ends and "continuous" extension type furnished with cast joiner. It uses two or three 40-watt fluorescent lamps and can be mounted as individual units or in continuous arrangements. Side baffles shield the lamps. Additional shielding, if desired, can be had with egg crate louvers. Edwin F. Guth Company, 2615 Washington Ave., St. Louis, Mo.



GUTH FLUORESCENT TROFFER

Push Button Station

One of the devices developed in connection with the new line of Colt's industrial controls is the No. 202 push button station. It is styled for use with modern streamlined machines, designed for surface mounting. Cover has guard ring raised full height of start button to prevent accidental operation. Usual mounting is vertical but if horizontal mounting is desired, button can be turned to read correctly in that position. Internal mechanism is self-contained on block which is mounted directly on metal base by two screws. Base has two conveniently located mounting holes in opposite corners and has 1/2-in. and 3/4-in. pipe knockouts on both ends. Colt's Patent Fire Arms Mfg. Company, Hartford, Conn.



COLT'S PUSH BUTTON STATION

Dependable Service

for
**FRACTIONAL
HORSE POWER
MOTORS**

WHEN you replace worn brushes with Superior Carbon Brushes you are assured of long life and reliability throughout. Because Superior is made with the consummate skill of engineers steeped in the knowledge of motor performance

ALL THAT THE NAME IMPLIES

**SUPERIOR
CARBON PRODUCTS
INC.**

9115 George Ave. Cleveland, O

**SUPERIOR
CARBON
BRUSHES**



**A SIZE
and TYPE
for every
need!**

STRAIGHT CONNECTOR
For Conductors of Equal Size



Catalog Nos. ST500 to ST2000

Designed to resist excessive pull-out strain.

UNIVERSAL STRAIGHT CONNECTOR

Both ends of this Connector are Adjustable



Catalog Nos. O4 to O201

Each end fits over moderate range of conductor sizes.

WRITE FOR CATALOG 3LC

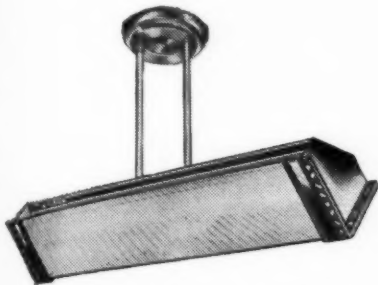
**KRUEGER
and
HUDEPOHL**

232-8 Vine St.
CINCINNATI,
OHIO



Lighting Fixture

This fluorescent "Two-Panel" fixture is designed for use in stores, offices, displays, homes and hotel rooms. The fluorescent light is diffused through clear molded glass, giving shadowless high intensity downward illumination. Inner reflecting surface is designed to give even ceiling illumination and end pieces are indirectly illuminated. Panels are easily removed for cleaning and relamping. Fixtures may be installed in place of 4-or 6-inch glass fitter globes, or may be suspended by hangers. Wilson Lighting, Inc., 411 South Clinton Street, Chicago, Ill.



WILSON "TWO-PANEL" FIXTURE

Circuit Breaker

A new "De-ion" enclosed circuit breaker designed for protection of all types of light and power circuits. Type AB-1 breaker is made in four frame sizes, including ratings from 15 to 600 amperes in steps corresponding to commercial wire sizes. All are available with voltage ratings from 250-volts a.c., 125/250-volts d.c. to 600-volts a.c., 250 volts d.c. Some of the features are silver contacts operated by toggle mechanism; bimetal thermal elements to prevent tripping due to harmless overloads; rust and corrosion resisting metal parts; and "de-ion" method of arc quenching. Enclosed in water and dust tight case. Operating handle is on front. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.



WESTINGHOUSE CIRCUIT BREAKER

ESSEX MAGNET WIRE

Essex enameled Magnet Wire has exceptional varnish resistance—highest abrasion resistance—maximum flexibility

The following types of Essex Quality Magnet Wire can be furnished in any combination of insulations:

Plain and Heavy Enamel	Cotton Covered (Round, Square, Rectangular)	Cellophane Covered
Formvar	Paper Covered	Celanese Covered
Nylon	Silk Covered	Glass Covered
		Litzendraht

Let us suggest the specific type and kind of magnet wire best suited for your particular applications. Prompt service and deliveries.

Booth Numbers 1-2-3 NISA convention, Buffalo, New York

ESSEX WIRE CORP.

MAGNET WIRE DIVISION

FORT WAYNE

INDIANA

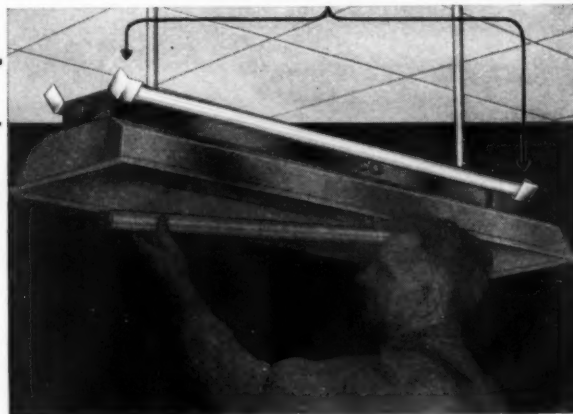
Sales Offices and Warehouses: *Atlanta—*Boston—*Chicago—Cleveland—Des Moines—*Detroit—*Los



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PATENTED HINGED LAMP HOLDERS



PREVENT BREAKAGE AND SAVE CLEANING TIME

The arrows in the illustration point to the Patented Hinged Lamp Holders (exclusive with OAMCO) attached to each side of the Control Housing on OAMCO RLM Standard Fluorescent Lamp Fixtures. The lamp can be placed in these holders while cleaning the reflector. They lie flat against the control housing, completely out of the way, when not in use. This arrangement saves time in cleaning and eliminates breakage—consequently reduces maintenance and replacement costs. Let us send you catalogs on our Fluorescent and other Industrial and Commercial Light units.

Member of RLM STANDARDS INSTITUTE

OVERBAGH & AYRES MFG. CO.

411 S. CLINTON ST.

CHICAGO, ILL.

THERE ARE PROFITS IN AIR CONTROL!

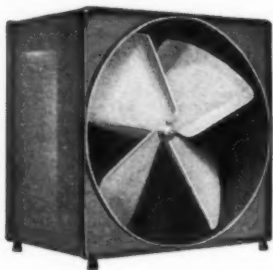
Stop Losses from stale air

in

Factories, Offices
and Stores with

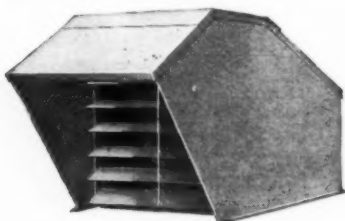


COMFORT VENTILATION



MODEL SK—EXHAUST UNIT

Fresh air in motion cuts production costs for the manufacturer by eliminating worker fatigue and error caused by stale air. Air circulation helps the managers of stores and restaurants to increase sales by providing more desirable and healthful conditions for patrons.



ROOF MODEL

In the REX-AIRATE line are the widely adaptable SK models, the Roof Model, Floor Circulators, and Window Ventilators. REX-AIRATE features include:

- Belt drive for quiet running
- All-steel construction
- Full range of sizes
- Reliable capacity ratings

Another fast-selling REX-AIRATE unit is the "Attik-Pak"—a complete package attic ventilator for homes.

WRITE TODAY for the booklet "Comfort Ventilation" and for full details on our money-making line.



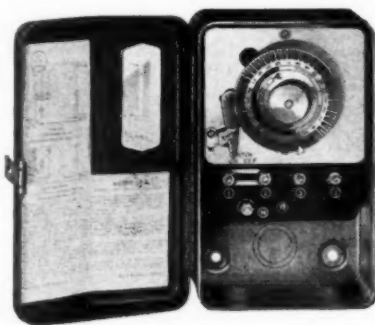
Div. of The Cleveland Heater Company
1935 West 114th St.,
Cleveland, Ohio

EQUIPMENT *News*

[FROM PAGE 115]

Time Switch

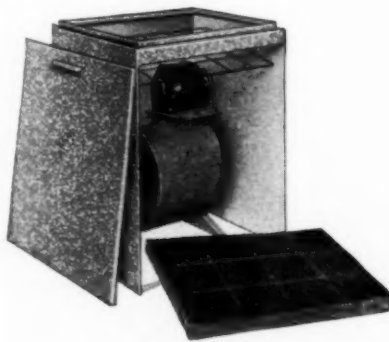
The new 300 Series time switch is made with two exposed gears; all other operate in sealed oil bath and are always lubricated. It is not affected by dust. Operation is by slow speed, 450 rpm., industrial type self-starting synchronous motor. For actuating off-tripper there is a reserve power of 40 pounds. Operates at temperatures as low as 20 degrees below zero. Paragon Electric Company, 37 West Van Buren Street, Chicago, Ill.



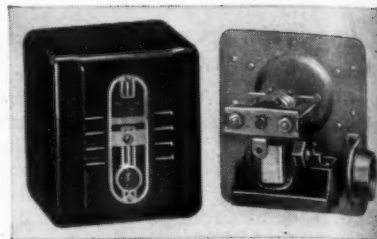
PARAGON TIME SWITCH

Winter Air Conditioner

A new small package unit has been developed that will convert a standard gravity furnace installation into a modern forced air system. Known as Model EP-01, it cleans, filters and forces warm air from furnace to every room. Steel cabinet is finished in hammered silver. It is 24½-in. wide, 20-in. deep and 30-in. high. Blower has capacity of 850 CFM for furnaces of 65,000 BTU output. The 1/6 hp. top mounted motor with V-belt drive is mounted on adjustable base for proper belt tension. Bearings are rubber mounted, self-aligning and self lubricating. Viking Air Conditioning Corporation, 9500 Richmond Avenue, S.E., Cleveland, Ohio.



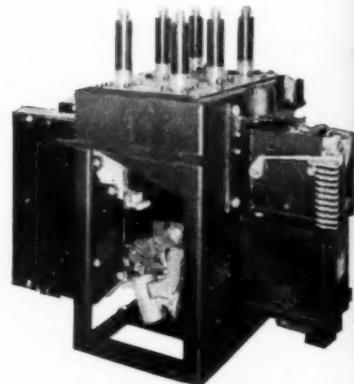
VIKING AIR CONDITIONER



JEFFERSON PRESSURE SWITCH

Pressure Switch

Pressure switch No. 611-030 is designed for use on domestic water pump, pneumatic and oil systems, to control stopping and starting of small single or polyphase a.c. motors on predetermined pressure settings. Switches have a working pressure range up to 80 pounds inclusive and differential between "on" and "off" position may be specified and adjusted according to customer's specifications. Adjustments for various pressure ranges are easily made. The pressure indicated on scale, attached to supporting rack, represent lower operating pressures. The differential between "on" and "off" is usually 20 pounds. Jefferson Electric Co., Bellwood, Ill.



G-E CIRCUIT BREAKER

Circuit Breaker

A new breaker, known as Type AM-10-25, for severe industrial service, has been added to this line of magne-blast circuit breakers. It meets requirements for applications in steel mills, chemical and automotive manufacturing plants and industrial manufacturing plants, and central stations. It is rated 250,000 kva. for services from 4200 to 7500 volts. Solenoid mechanism is mounted on front of breaker and isolated from it by steel panel. Higher insulation and service voltage ratings have been obtained by coordination of insulation in arc chute, increased phase spacing and separate box barrier for each phase. Principle of driving arc into an interleaving arc chute by magnetic blowout coils has been retained, together with contact design principle of other breakers in the line. General Electric Co., Schenectady, N. Y.

THIS PAYS OFF
NOT THIS!

OK
FOR SERVICE

JOB HELD UP
FOR
TIME SWITCH

You can get G-E TIME SWITCHES when you want them . . . They're a STOCK ITEM

WHEN your wiring jobs include the installation of a time switch it will pay you to use General Electric switches. The nearest G-E distributor has them right on his shelf. This means you can complete your jobs—and collect. You don't have to leave them "hanging fire" waiting for switches—no tie-up of investment in time and materials.

Your customers will like this Type T-44 switch because:

1. It's accurate and dependable—powered by the reliable Telechron motor.
2. It's a simple matter to change the ON and OFF time as the seasons change.
3. Its design presents a pleasing appearance—can be installed in plain view.

You'll like it because:

1. It's small and lightweight—can easily be held in one hand while installing.
2. It's easy to wire—plenty of space beneath the terminals, five standard knockouts, and clearly marked connections make wiring speedy and sure.
3. As for servicing, you can install it and forget it.

Use this G-E time switch on your next job. If your regular dealer doesn't handle G-E switches, get in touch with the nearest G-E office. They'll send you, from stock, as many as you require that same day.

Ask our office for a copy of Bulletin GEA-1427. It describes the T-44 switch in detail. General Electric Co., Schenectady, N. Y.

GENERAL  ELECTRIC

603-20-6500

THIS "Sure-Power" COMBINATION MEANS EXTRA SATISFACTION ON YOUR INDUSTRIAL JOBS



TWIST-LOCK Connectors

"Twist-Lock" Connectors are built specifically for severe industrial service, for connection to portable tools, etc. This 3-wire polarized type has grounding blade longer than others to make contact first and break last. Types having fusible caps also now available.

During days of peak production, electrical tools encounter more "slam-bang" treatment than usual. They need a "sure-power" connector that will put an end to production interruptions. The Hubbell Twist-Lock is specifically designed for such industrial service. It can never part in the middle of a job — a lock-fast connection is made by a twist of the cap. For positive protection against electrical hazard and disconnection delays, be sure to install the Hubbell Twist-Lock.

And, for positive supply service, buy "via GRAYBAR." GRAYBAR offers the finest products of 200 leading manufacturers — backed by the satisfaction-insurance of the GRAYBAR tag. Always remember that one of GRAYBAR'S 87 warehouses throughout the country is convenient to you. For a combination that assures satisfied customers, and extra profit as well, order Twist-Lock connectors from GRAYBAR.

Graybar
ELECTRIC COMPANY
OFFICES IN OVER 80 PRINCIPAL CITIES
Executive Offices: Graybar Bldg., N. Y.

EQUIPMENT *News*

[FROM PAGE 116]

Industrial Unit

Two new fluorescent units for industrial use. One is a two lamp 100-watt and the other a two lamp 40-watt, with removable porcelain or baked enamel reflectors, ends open or closed. Ballast, compensator and all wiring are located in top channel, and reflector is removable during installations, cleaning and maintenance. Each unit is equipped with brackets and knockouts for conduit hangers. 40-watt wireway is 50-in. long; 100-watt wireway is 62-in. long. Closed end units can be had with glass bottom. Garco Lighting Company, Ogden Blvd. and South Talman Ave., Chicago, Ill.



GARCO INDUSTRIAL UNIT

Temperature Relay

An improved temperature relay, known as Type CFT, is for protection of machines and transformers against overloading. It embodies the induction-cylinder design and supersedes Type ICT induction-disk relay. No change has been made in circuit and relay still serves as galvanometer in Wheatstone bridge circuit, comprising a resistance temperature detector in one arm and tapped bridge resistors in other three arms. Normal operating region of relay is close to pickup point. Usual adjustment of this relay is same as that of previous type. It is adjusted to close its low temperature contact at 80° C and its high temperature contact at 95° C with a 30° C ambient. General Electric Company, Schenectady, N. Y.



G.E. TEMPERATURE RELAY

Just off the press! THE NEW NATIONAL ELECTRICAL CODE HANDBOOK

COVERING THE NEW 1940 CODE

By Arthur L. Abbott

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FIFTH EDITION

585 pages, 5 x 7 1/2,
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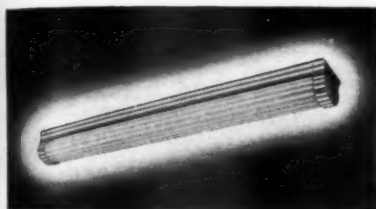
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Lighting Unit

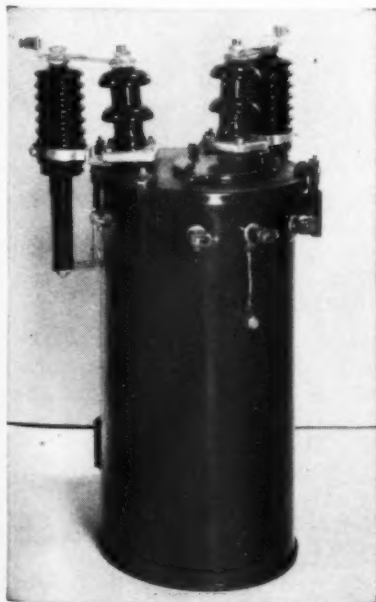
This glass enclosed fluorescent unit, known as the Hunter, is designed for use as single units or as a continuous strip. Each unit houses all ballast equipment. Where two or more units are interconnected, two-lamp ballasts are used. Slide glass along channel for relamping. Unit is inter-connected by means of two angles; two sections can be mounted at one time. It uses 40-watt lamp and operates on 110-volt, 60-cycle, a.c. Size of unit is 5½-in. in width and 4-ft. 2-in. in length. Standard suspension is 4½-in. The F. W. Wakefield Brass Company, Vermilion, Ohio.



WAKEFIELD FLUORESCENT UNIT

New Transformer

A new simplified outdoor distribution transformer, using a magnetic material known as Hipersil, has a one-third greater flux-carrying capacity with no increase in magnetizing force and losses. Use of this material in cores reduces size and weight of transformers as much as 25 per cent, reduces copper losses about 10 per cent, increases short-time overload capacity, decreases magnetic hum and improves voltage regulation about 10 per cent. In single-phase units, a new two-piece butt-joined core assembly makes core replacement easy. Three phase units have conventional stacked cores. Available in sizes from 1½- to 500-kva. for voltages of 2400, 4800 and 7200. Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa.



WESTINGHOUSE HIPERSIL TRANSFORMER

Great News— The New UTILITY TESTER



The UTILITY TESTER is a new kind of instrument for testing all electrical circuits, and appliances such as — MOTORS, RANGES, HEATERS, IRONERS, WASHERS, SUN LAMPS, TOASTERS, AIR CONDITIONERS, VACUUM CLEANERS, REFRIGERATORS, in fact any and every device that uses an electrical source of current. THE UTILITY TESTER enables every possible measurement necessary to service any electrical utility.

SPECIFICATIONS:

3 WATTAGE RANGES; A.C. AND D.C.
0-100 Watts 0-1000 Watts 0-5000 Watts.

The UTILITY TESTER reads the wattage consumption (subject to power factor correction) of any appliance, motor, etc., while it is in operation. This is a feature never before obtainable in any instrument selling for less than \$50.

6 VOLTAGE RANGES; A.C. AND D.C. 0-1 Volt 0-10 Volts 0-50 Volts 0-100 Volts 0-500 Volts 0-1000 Volts.

4 CURRENT RANGES; A.C. AND D.C. 0-1 Ampere 0-10 Amperes 0-50 Amperes 0-100 Amperes.

As far as we know no instrument selling for less than \$50.00 has ever enabled current measurements up to 100 Amperes. The UTILITY TESTER provides this service on both A.C. and D.C.

2 RESISTANCE RANGES: 0-300 Ohms 0-3000 Ohms.

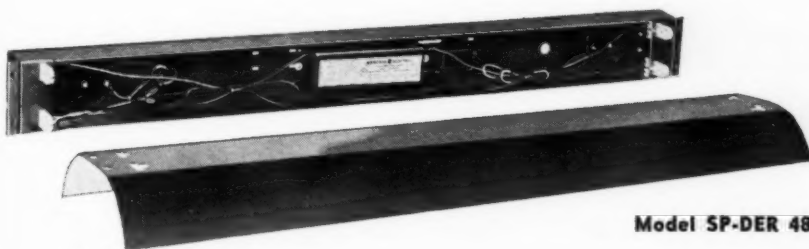
The UTILITY TESTER reads all resistances commonly used in electrical appliances and in addition reads extremely low resistances. For instance, 1½ ohms appears on the center of the low ohms scale and resistances as low as 1/50th of an ohm are easily read. This is a feature never before obtainable in an instrument selling for less than \$50.

THE UTILITY TESTER COMES COMPLETE WITH LEADS, PORTABLE COVER, SELF-CONTAINED BATTERY AND INSTRUCTIONS. NOTHING ELSE TO BUY.. ONLY

\$11.85

SUPERIOR INSTRUMENTS CO. 136 LIBERTY ST., DEPT. C5.
NEW YORK, N. Y.

NEW! REFLECTO DUCT* with REMOVABLE PORCELAIN REFLECTOR



Model SP-DER 48

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- Easier to Service!
- Made to Best Specifications!
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- Prompt Deliveries!
- Unit Top Contains All Wiring!
- Sockets, Starters, Coils!

• The New Model SP-DER 48 Reflector* Duct accommodates 2 40-watt lamps. The new unit-top construction cuts erection time in half. All units are wired with H.P.F. ballasts, (includes compensators). Uses only E.T.L. approved sockets, starters and cords. Knockouts in ends of unit top and on top for conduit suspension. Competitively priced (includes cord and chain). PROMPT DELIVERIES!

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Lots of 6 or more—
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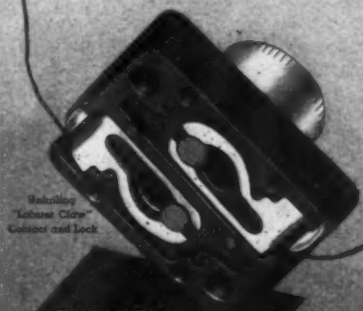
For Perfect REMOTE CONTROL

Lloyd Starter Socket

For Remote Mounting

- Starter may be inserted or removed without disturbing lamp.
- Cuts down lamp breakage.
- May be mounted at any distance, wherever most convenient.
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- Has the patented can't-jar-loose "LOBSTER CLAW" dual contacts with positive lock.

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on the Market**



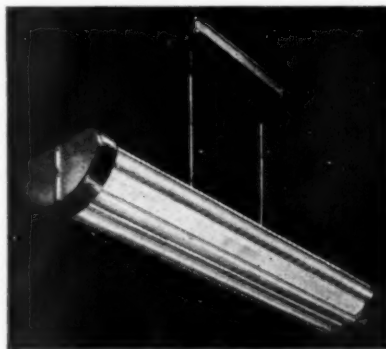
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LLOYD Products Co.
PROVIDENCE, RHODE ISLAND
Representatives in 22 Leading Cities

In the News

[FROM PAGE 119]

Fluorescent Unit

This sight-craft commercial natur-lite fluorescent lighting unit is for installation in stores and offices. Reflector is finished in white Vitrolux fired porcelain enamel. Hanger and end plates are finished in satin aluminum. This unit is available with or without hanger. Smoot-Holman Company Inglewood, California.



SMOOT-HOLMAN FLUORESCENT UNIT

Fluorescent Fixture

This fluorescent pendant luminaire is known as the Starlux. Aluminum-lacquered end pieces carry contrasting bronze-lacquered ornamental castings. Diffusing glass is used in side panels and white Fluracite louver for direct, high-level lighting. Units may be coupled together and installed in continuous line. It uses four 40-watt fluorescent lamps. Depth of unit 64-in., length 494-in., width 14-in. Suspension from ceiling to top of luminaire body 36-in. Curtis Lighting, Inc., 6135 W. 65th Street, Chicago, Ill.



CURTIS STARLUX

DRILL CONCRETE the Easy Way



The old arm and hammer method is slow, hard and expensive. Use the Wodack "Do-All" Combination Electric Hammer and Drill and drill 15 times as fast in concrete and masonry. Two tools in one. With hammer member removed it's an electric drill with 1/2" chuck. Cuts cost of drilling for expansion anchors. Universal motor 110 or 220 v. Ask for Bulletin.

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**Tests Everything Electrical
From 100 to 550 Volts**

Indispensable to electricians. Equipped with Neon light which tells instantly where trouble lies in electric circuits, fuses, cut-outs, motors, radios, electric appliances, indicates hot or grounded wires, tells A.C. from D.C. Only Test-O-Lite, original Neon Tester, has exclusive patented safety features. Far superior to clumsy test bulb. Fountain pen size with pocket clip. Useful in homes also. List \$1.50 at leading jobbers.

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WATTS



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Used in HOMES, FARMS, SCHOOLS, THEATRES, PUBLIC BUILDINGS, CITY, STATE and FEDERAL DEPARTMENTS, BOATS, TRUCKS, TRAILERS, RADIO STATIONS. Many others. Operate LIGHTS, RADIO TRANSMITTERS and RECEIVERS, Motors, Tools, Appliances, X-Ray and other Medical Equipment and Standby Emergency Service in case of POWER LINE FAILURE. Sizes through 50,000 Watts—any Voltage or Frequency—Air or Water-Cooled—Gasoline, Natural Gas, Oil or Diesel Powered.—110 or 220 Volt, A.C., 12, 32 or 110 volt, D.C. or any Special Voltages are available. Many NEW 1941 Models.

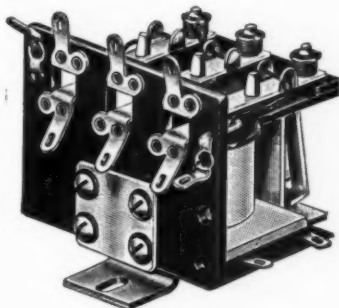
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Relays

A 3-pole relay has been added to this line of Type C relays. One of the features is the self-cleaning wiping action of contacts. Each time contacts in Type C relays close, one contact is drawn a small distance across the other, thus operating to displace dust particles and to wear through films of corrosion, if any. Additional features include long mechanical and electrical life, reliable operation and machine assembly of parts. Supplied for a large variety of operating voltages, either a.c. or d.c. these relays can also be had with any number of contact materials to suit particular job for which relay is to be used. G-M Laboratories, Inc. 1735 Belmont Ave., Chicago, Ill.



G-M LABORATORIES RELAY

DOLPH'S No. 23-C Protects Degaussing Cables on New Ships

New York City.—Degaussing cables form an important feature on many of the ships,—freighters and tankers,—now being built in American shipyards in connection with the nation's defense program. In the making of these cables, DOLPH'S No. 23-C Black Coating has been found the ideal material for the protective coating that is a vital necessity for the proper functioning of these devices. This material is applied between the wrappings of the cables and two or more applications are given to the outer surfaces. The coating seals the lapped edges of the canvas tape wrappings, and provides a thorough protection against damage from oil or water, and when dry does not support a flame. Used in connection with No. 23-C Black Coating is DOLPH'S No. 173 Gray Surface Cable Paint which serves as an additional filler and also provides a prime coat for the subsequent applications of what ever painting scheme may become necessary.

SYNTHITE PG-1 Insulation Adopted By Maker of Heavy Duty Armatures

Newark, N. J.—DOLPH'S SYNTHITE PG-1 Clear Baking Varnish, recently introduced into the electrical insulation field, has been adopted by a prominent New Jersey motor manufacturing company as the best material of its kind for use on heavy duty coal mine armature windings. In the construction of this equipment, the winding assemblies were given two dip and bake applications of SYNTHITE PG-1. Despite the size of these winding assemblies, a baking cycle of only 14 hours at 265°F. was required. Adoption of DOLPH'S SYNTHITE PG-1, in this instance, followed tests which showed that when the treated armatures were revolved upwards to 7000 RPM, the winding assemblies did not throw out and the varnish did not resoften as the result of operating at elevated temperatures. Here, as in an increasing number of cases elsewhere, DOLPH'S SYNTHITE PG-1 met the long-standing demand for a deep drying varnish and solved a problem that faced electrical men for many years. One of the outstanding characteristics of SYNTHITE PG-1 is that it provides maximum bonding strength between coils and slot cells.

DOLPH'S Blue Metal Lacquer Keeps Exposed Motor Parts From Rusting

Bayonne, N. J.—A large manufacturer of heavy duty electric motors for marine uses, seeking a material that would provide maximum resistance to rust formations on highly polished armature shafts, laminated rotor assemblies, stator frames, etc., found it in DOLPH'S No. 43 Blue Metal Lacquer. The parts treated with this material are ready for handling after a 3 to 5-minute air dry and, most important of all, have been made oil and moisture-proof. The material's extremely thin build-up does not interfere with machined tolerances found on motor pulleys, etc. A gun metal blue shade is given to the treated surfaces. When necessary, the lacquer may be removed merely by washing the treated parts with alcohol.

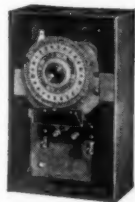
Further information concerning the above products may be obtained by writing the JOHN C. DOLPH COMPANY, 168A Emmett Street, Newark, New Jersey. ADV.

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Ratchet Setting Dial; One Minute Accuracy; Hinged Cover; Lots of Room; 12 Knock-outs; 1 R.P.M. Indicator

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191 B—Single Pole, 35 Amp. 13.00
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Apt. House, 2-S.P. Circuits 22.50
Sixty Minute and Four Hour Timers

DEALERS PROFIT

Single30%
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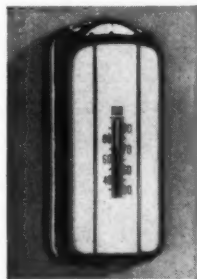
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The Tork Clock Co.
MOUNT VERNON, NEW YORK

Thermostat

This new cooling thermostat is for use in control of unit room coolers, central plant coolers and individual zones in zone systems. Heater element within instrument produces a difference in temperature between thermostat and room, which varies inversely with "per cent time on" of cooling equipment. It automatically and gradually increases instrument temperature setting from 72 to 80 degrees F. as outside temperature rises to point where cooling equipment would normally run full time. Thermostat has ratings of 2 amperes at 25 volts and 2 amperes at 110 or 220 volts when used with adapter assembly. General Electric Co., Schenectady, N. Y.



G-E THERMOSTAT

Buying and S

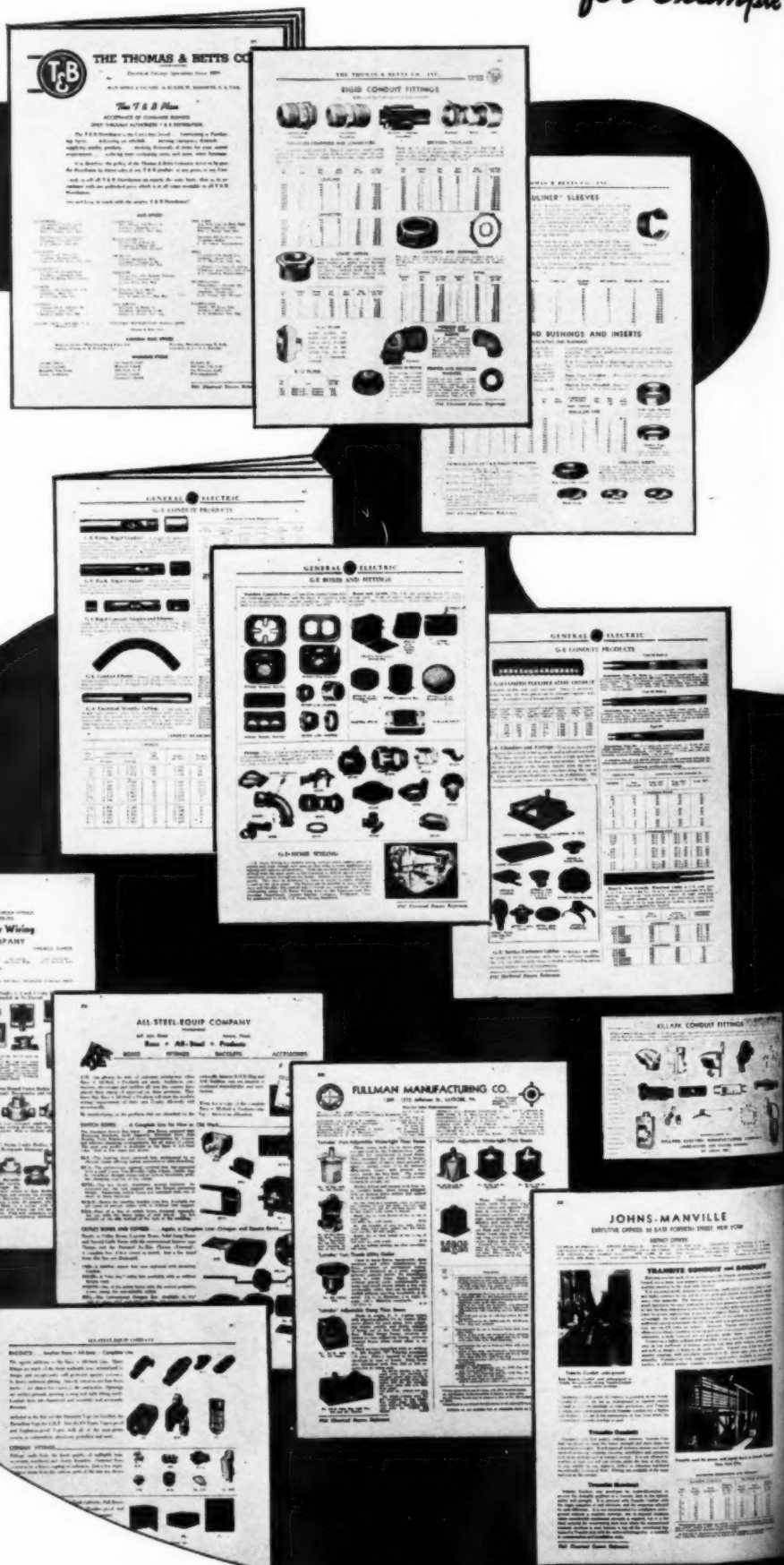
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- 3 **INDEX TO DIRECTORY CLASSIFICATIONS**
A GUIDE TO SECTION 4 47
- 4 **COMPANY AND TRADE NAME INDEX**
ABRABOD, ALPHABETICALLY 513

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That's ALL: And that's why active electrical men say that Electrical Buyers Reference is the most valuable book in the office. It's better than a whole closet full of catalogs. Because it's easy to use, quick, and efficient. Because 238 manufacturers have condensed catalogs in it. And because products of over 3500 manufacturers of electrical and allied products are *completely indexed*.

P. S. 26 leading fittings manufacturers have catalogs in Electrical Buyers Reference. We've reproduced some of the data contained in these catalogs . . . to give you a quick idea of the completeness of the material in Electrical Buyers Reference.

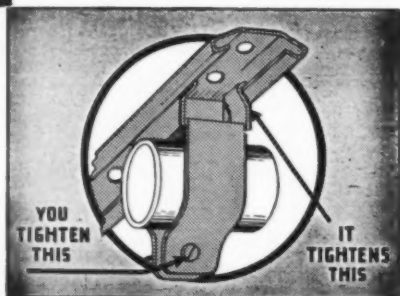
Note the bold face listings referring you to manufacturers' catalogs...

McGRAW-HILL PUBLISHING COMPANY, INC. • 330 WEST 42nd STREET, NEW YORK CITY

[illegible]

With Only One Screw
to Tighten . . .

THE CLEVELAND CONDUIT HANGER



Gives You a Quicker
Easier Installation

"CONVINCE YOURSELF"

"Send for Circular
Giving Full Details"

THE CLEVELAND SWITCHBOARD CO.
2927 E. 79 St. Cleveland, Ohio

EVERY BATHROOM NEEDS THIS Extra HEAT



You need this bathroom heat every day in the year. When it's too warm for unit heat or too cold for unit heat alone—Thermador Built-In Bathroom Heaters are the answer. Just a flip of the switch and you are instantly blanketed in flameless, fumeless electric warmth.

THERMADOR ELECTRIC BATHROOM HEATERS

THERMADOR ELECTRICAL MFG. CO.
5119 So. Riverside Dr., Dept. EC 5
Los Angeles, California

Gentlemen:

Please send me complete contractors
specifications and prices.

Name _____

Street _____

City _____

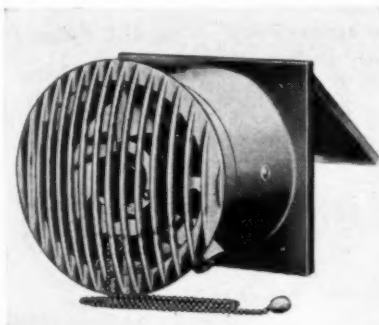
State _____

EQUIPMENT *News*

[FROM PAGE 121]

Kitchen Fan

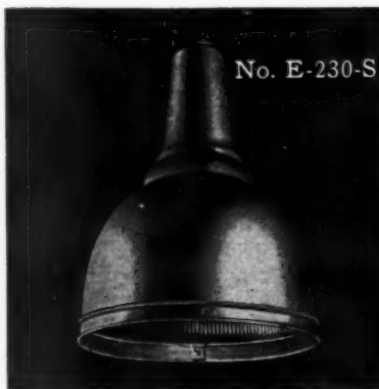
A new line of kitchen ventilating fans, known as "Ilgvent", features portable, package-type and built-in models. The rust-resisting steel cabinet of the built-in model is of the telescopic type, with sleeves available to fit wall thicknesses from 5½-in. to 31-in. The weather-proof, one-piece door on outside of house is opened or closed by beaded pull chain, causing fan motor to start or stop. Has a capacity of 350 C.F.M. Ilg Electric Ventilating Company, 2850 N. Crawford Ave., Chicago, Ill.



Ilg KITCHEN FAN

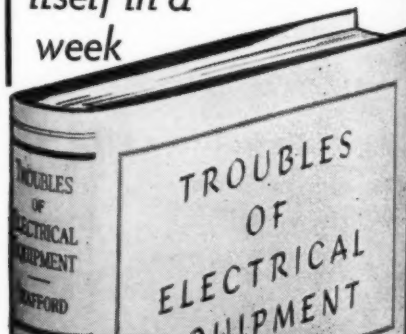
Lighting Fixture

Permaflexor No. E-230-S series provides a metallic protective enclosure. Used in interiors of industrial plants, power houses, gymnasium, auto repair shops or where reflector enclosure seems desirable. Has spun aluminum housing, removable reflector retaining ring and medium base porcelain socket with female cap, for attaching to any standard ½-in. conduit hanger. Units also available equipped with removable concentric louver for concealment of light source or hinged wire guard. Uses 200 and 300 watt lamps. Pittsburgh Reflector Company, Oliver Building, Pittsburgh, Pa.



PITTSBURGH REFLECTOR UNIT

A trouble-shooting
tool—that will pay for
itself in a
week



• SHOWS HOW TO QUICKLY LOCATE motor troubles—transformer troubles—circuit breaker and relay troubles—troubles of lighting arresters—insulation troubles—voltage-regulator troubles—cable troubles.

• SHOWS HOW TO DIAGNOSE THEM ACCURATELY

• SHOWS HOW TO CORRECT THEM

This book brings you in compact, usable form practical pointers and trouble charts that you will use the first day you get the book in your hands.

TROUBLES OF ELECTRICAL EQUIPMENT

Their Symptoms, Causes and Remedy

By H. E. Stafford
Consulting Engineer

JUST OUT

New 2nd Edition
Revised and
Enlarged

373 pages, 6x9,
330 illustrations
25 tables, \$3.00

This book covers the symptoms, causes and remedy of troubles of both a-c and d-c apparatus usually found in the average industrial plant. Includes priceless

practical hints on efficient operation and maintenance. A practical, how-to-do-it book that is an indispensable job manual for the electrical maintenance man. All formulas illustrated by practical examples and all technical terms explained in everyday English.

Mail this coupon today for—

10 DAYS' FREE EXAMINATION

McGraw-Hill Book Co., Inc.,
330 W. 42nd St., N. Y.

Send me Stafford—Troubles of Electrical Equipment for 10 days' examination on approval. In 10 days I will send \$3.00 plus few cents postage, or return book postpaid. (Postage paid on orders accompanied by remittance.)

Name _____

Address _____

City and State _____

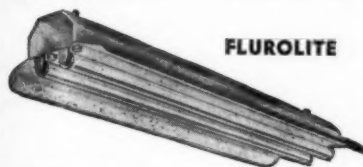
Position _____

Company _____ EC-5-41

(Books sent on approval in U. S. and Canada only.)

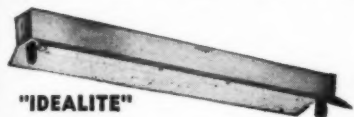
FLUORESCENT REFLECTORS

... MORE INSTALLATIONS
BECAUSE OF OVERTIME
DEMANDS.



FLUOROLITE

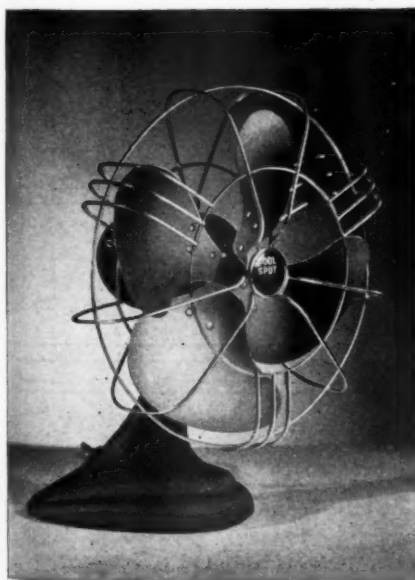
MULTI



"IDEALITE"

More and faster production needs necessitate 24-hour working days in many industries. In some cases true daytime lighting is important. These are your Fluorescent installation opportunities. The MULTI line of fixtures gives you many types from which to choose to turn out a good job. Send for literature on our Fluorescent Fixtures and on our other Industrial Reflectors.

MULTI ELECTRICAL MANUFACTURING CO.
1840 W. 14TH ST. CHICAGO, ILL.



Signal's 1941 fans are the ultimate in beauty, quality and moderate price.

Fan shown here is No. 562 10" Oscillator.

SIGNAL ELECTRIC MFG. CO.
MENOMINEE, MICHIGAN
Offices in all principal cities

SIGNAL

Specializing In Transformers

[FROM PAGE 23]

service, the customer need only identify the machine or the driven device and detailed name plate data and control specifications can be promptly drawn from the file.

This customer data file provides a check on the operation of the customer's equipment as well. When a machine shows a history of motor trouble it indicates at a glance that an instrument survey and test is needed.

Large Inventory

Located far from metropolitan distribution centers, the Fagan Electric Company maintains an unusually large inventory of all types of materials and repair parts, as well as major equipment. This extensive parts stock Fagan considers an important part of their service to their customers and customers have grown to rely on it. The complete stock includes a carload of Kuhlman transformers, Westinghouse industrial motors and controls, pulleys and V-belts and over \$20,000 worth of magnet wire.

In the background of this enterprise is a fine balance of technical and business competence. Every transaction must be profitable to both the customer and the firm, Fagan believes. "High standards of technical ability and sound business methods are equally essential," he says, "because each depends on the other. Without sound business methods, we could not own and develop our machines and instruments nor hire the highly trained mechanics needed to perform a technical job with economy and skill."



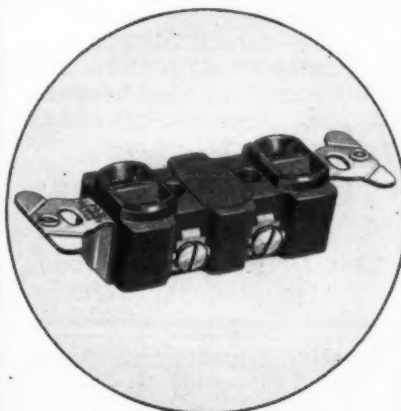
FRIENDLY COMPETITORS J. Kent White, Alexandria, Va., and B. W. Chamberlin, Arlington, Va., discuss important phases of their contracting business in White's shop. According to J. K. the boys in that territory show a fine spirit of cooperation.

P&S

WIRING DEVICES

The Modern DUPLEX CONVENIENCE OUTLET

Approved under Federal
Specification W-R-151



Cat. No. 13202

FEATURES

Contacts grip both sides of cap blades.

Break-off plaster ears.

Large binding screws will accommodate #10 wire—Spaced for easy wiring.

When used with Bakelite plates, the plates will not crack.

Modern P&S - Despard face design.

Standardize on this reliable precision-made outlet.

**Sold Through
Electrical Wholesalers
Catalog on Request**

Pass & Seymour, Inc.
SYRACUSE, N. Y.

PYLETS

WITH
self-aligning covers
save time and
prevent trouble

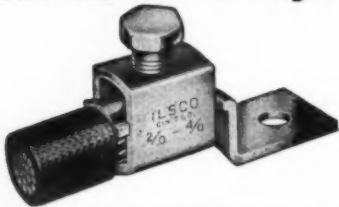


PYLETS
... the improved heavy duty conduit fittings
Standard and Explosion-proof types
PLUGS AND RECEPTACLES
VAPORTIGHT FIXTURES
FLOODLIGHT PROJECTORS
AIRPORT LIGHTING EQUIPMENT
Write for bulletins

**THE PYLE-NATIONAL
COMPANY**
1344 North Kostner Avenue
CHICAGO, ILLINOIS

ILSCO SOLDERLESS CONNECTORS

**HAVE YOU TRIED
The New IlSCO Lugs?**



BUILT FOR OVERLOADS!

The new design—as passed
by the Underwriters' Labo-
ratories May 1, 1940.

<p>GENTLEMEN Send me New Catalog and Sample</p> <p>Name</p> <p>Firm</p> <p>Address</p> <p>City & State</p>	<p>MAIL COUPON TODAY</p>
--	---

**ILSCO COPPER TUBE
AND PRODUCTS, INC.**
5629 MADISON ROAD ——— CINC., O.

How Insulation Resistance Varies [FROM PAGE 25]

bestos, mica and glass—were studied for the effects of temperature, moisture and type of treatment. A special form of test coil and testing equipment were developed. All test coils had an insulation thickness of .060 inches with a contact area of 82 sq. in. The equipment was planned for temperatures up to 225° C.

By using identical test coils treated in different varnishes, the effect of varnish type was isolated. After the temperature tests were made, the coils were exposed to closely controlled high humidity so as to determine the effect of moisture alone on each type of insulation and treatment.

Some of the curves showing these effects are shown. From the consistent results obtained with the special coils and equipment employed, these conclusions were drawn—

1. Glass insulation has tremendously higher insulation resistance than asbestos after exposure to high humidity. Treatment improves the resistance to moisture penetration, as would be expected. However, it is significant that after 16 days exposure to 98 per cent humidity, even untreated glass insulation had higher insulation resistance than asbestos with the best available treatment.
2. Different varnishes have a tremendous effect on the insulation resistance of fabric materials—cotton, asbestos and glass. This is because they are porous and therefore partake of the characteristics of the varnish. These same varnishes have a lesser effect on mica, which has its insulation resistance more largely determined by the overlapping flake structure of the mica than by the varnish itself.

3. Untreated materials when dry have a higher insulation resistance than treated materials. However, treatment protects against absorption of moisture when exposed to humidity. No material tested is impervious to moisture absorption but the ratio of change due to moisture is far less on some materials than others.

4. An interesting and important characteristic of textile glass insulation was disclosed by these tests. The untreated glass insulated coil did not fail under the high humidity test but maintained a steady value above asbestos coils thoroughly impregnated. This is interpreted to mean that the "non-hygroscopic" quality of the glass fibers is of greater importance in determining insulation resistance than the accumulation of moisture between the fibers. It is evident that asbestos fibers even when carefully impregnated absorb sufficient moisture to be the controlling factor in determining insulation resistance.

While the foregoing data is of a general nature it is hoped that it presents a clearer picture of the factors affecting insulation resistance than has existed generally.

SEARCHLIGHT SECTION

(Classified Advertising)

Employment : : Equipment
Business : : (Used or Resale)

"OPPORTUNITIES"

UNDISPLAYED RATE

15 CENTS A WORD, MINIMUM CHARGE \$2.00
Positions Wanted (full or part time salaried employment only), 1/2 the above rates payable in advance.
Box Numbers—Care of publication New York, Chicago or San Francisco offices count as 10 words.
Discount of 10% if full payment is made in advance for 4 consecutive insertions.

DISPLAYED RATE

Individual Spaces with border rules for prominent display of advertisements.
The advertising rate is \$8.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
An advertising inch is measured 3/4" vertically on one column, 3 columns—30 inches—to a page.

OPPORTUNITIES

BUYING, selling or investment opportunities naturally receive most interested consideration from individuals who are engaged in the industry with which such opportunities are associated. Such men know the requirements and possibilities of their industry. Business and personal interests and ambitions assure their being readers of this their business paper. An advertisement in these columns therefore provides the logical medium for inviting their consideration of business "opportunities" that are offered in the field of electrical construction, maintenance and repair work.

POSITION VACANT

ELECTRICAL ENGINEER—Technical graduate qualified by experience to supervise construction and act as field consultant on small and medium contracts involving industrial power, control, lighting, and substations. Should have drafting room experience. Some travel. Application must mention salary expected and give complete training and experience record. Location—Michigan. P-22, Electrical Contracting, 520 N. Michigan Ave., Chicago, Ill.

POSITION WANTED

ELECTRICAL ENGINEER AND ESTIMATOR—Technical graduate, 18 years experience with New York contractors, registered state permit. Qualified to supervise, install, engineer layout or prepare estimates. Go anywhere. PW-21, Electrical Contracting, 330 W. 42nd St., New York, N. Y.

USED EQUIPMENT

ANOTHER OPPORTUNITY FOR ELECTRICAL DEALERS

You can buy completely overhauled and performance tested electric motors, generators, transformers, MG sets, welders, platens, etc., from Moreco and Resell at competitive prices and still make plenty profit. Send us your inquiries. We co-operate with dealers.

Here's a Bargain—Can you sell it?
150 KW West. Rotary Converter, 125/250 volt, 3 Wire, DC. 6 Ring, 2 or 3 Phase AC. with transformers for 2300 Volt Primary. AC and DC panels.
THE MOTOR REPAIR & MFG. CO.
1560 Hamilton Ave. Cleveland, Ohio

TOOLS USED ON POWER HOUSE CONSTRUCTION All in good condition

Electric drills, drill stands, pipe tools, hydraulic benders, ladders, ropes, blocks, wrenches, vises, etc.
Will furnish list and prices if interested.
BREMER ELECTRIC CO.
502 E. La Salle Ave. South Bend, Ind.

WHERE TO BUY

Equipment, Materials and Supplies for Electrical Construction—Maintenance—Repairs

UNDERWRITERS' APPROVED

3 A G LITTELFUSES



Replaces large and bulky cartridge type fuses and their bulky mountings. Space savers. 16 sizes—ratings from 1/100 to 8 amps., 250 volts. All Underwriters' Approved. Write for catalog.

LITTELFUSE, INC.

4789 N. Ravenswood Ave. Chicago, Ill.



SUPERIOR NAIL KNOBS

Approved by National Board of Fire Underwriters.

SEND NOW for latest literature including new low price lists.

SUPERIOR PORCELAIN CO.

BOX 669 PARKERSBURG, W. VA.



New Type Louvered Fleur-O-Lier FLUORESCENT TUBES

These certified* louvered fixtures for the new 5-ft. fluorescent tubes make a new opportunity for better solution of lighting problems of all commercial installations—stores—offices—public buildings. Gets business for contractors by making a better lighting job.

* Approved by Electrical Testing Laboratories

Write for Booklet EC-51

R & W WILEY, INC. 777 Hertel Ave. Buffalo, N. Y.

Electric Operators
For Any Overhead Type Door
DOORS AND OPERATORS INC.
See page 309
Elec. Buys Ref. TIFFIN, OHIO

BIG SAVINGS
THE LOW COST
NELTO FLUORESCENT
UNION WIRED with ALZAK REFLECTOR
WRITE FOR OUR PRICES... FIRST!
Nelson-Tombacher Co., 224 Centre St., N.Y.C.

LAMP ANNUNCIATORS

How to Build Them!
Typical Annunciator Panel built with Underwriters Approved Kirkland #600 Bulb-I-units for 120 volt service.
It is only necessary to provide holes in the panel for each indication, insert the single hole mounting units, and the assembly is ready to wire and use.
Write for New Catalogue
Sold nationally by
THE GRAYBAR ELECTRIC CO., INC.
Mfd by H. R. KIRKLAND, CO., Morristown, N.J.

"FRIGID" QUALITY PRODUCTS
Manufacturers of
VENTILATING EQUIPMENT
EXHAUST FANS
SHUTTERS ATTIC FANS
BLOWERS INDUSTRIAL FANS
AIR CIRCULATORS
Write for Catalog and name of your nearest distributor. Low prices.
CIRCULATORS & DEVICES MFG. CORP.
100 Prince St. New York City

SODER . . .
Without Corrosion
Aluminum . Stainless
Steel . Copper . Brass
Steel, etc.
Send for free Samples
6715 Bryn Mawr Ave.
L. B. ALLEN CO. INC. Chicago, Illinois

A GOOD Habit
The Where-To-Buy Section of Electrical Contracting supplements other advertising in this issue with these additional announcements of products and materials of special interest and application in the field of electrical construction, maintenance and repair work. Make a habit of checking this page each issue—a good habit!

HUB ENGINEERED TROFFER SYSTEM
The Latest Development in Fluorescent Illumination

FREE! Write for new 62 page Manual #41 covering ARCHITECTURAL, COMMERCIAL AND THEATRICAL LIGHTING
Built-in Luminous Elements — Footlights and Border Lights — Architectural Luminaires — Cove and Special Reflectors — Stage Boards
Display and Trough Lighting — Spotlights and Floodlights — Exit and Illuminated Signs — Fluorescent Equipment — Dimmer Banks
HUB ELECTRIC CORP. 2221 W. Grand Ave. Chicago, Illinois

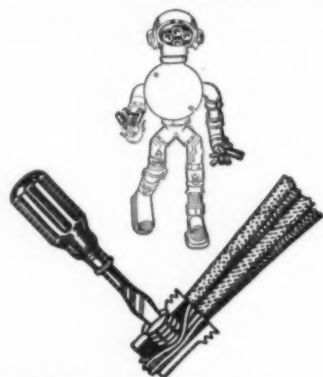
SpeedWay
Complete line of direct and back-gear "Flex Power" Electric Motors, A. C. and D. C.; any voltage. State requirement; 1 or a million on short notice. Catalog Free.
SPEEDWAY MFG. CO.
1866 S. 52nd Ave. CICERO, ILL.

Over 87% of the electric Hammers in use are Speedways because Speedways outperform and outlast all others. Write for circular.

SPEEDWAY MFG. CO.
1866 S. 52nd Ave. CICERO, ILL.

BUILD YOUR OWN FANS
MAKE UP TO
\$3500 Profit
ON SUMMER FANS
Every Electrical Contractor can boost his earning by cashing in on the big summer demand for the air circulator and exhaust fans he can build, sell and install. The market is booming. Sales are Easy—Profits are Big.
Whipple grossed \$3420; Prizmire, \$3740; Fried, \$4348; Dorsey, \$5120—they built Air Circulators, Exhaust Fans, Attic Fans, Evaporative Coolers, etc., in their spare time with Grainger's low cost Fan Parts and Parts Combinations. Write for catalog now.
GRAINGER'S FAN PARTS
— Save You From 25 to 50%
— Eliminate Inventory Gamble
— 24 Hours Order Service
— Easily and Quickly Assembled
— More Profit Per Fan Unit
FREE Bargain Catalog

W. W. GRAINGER, INC.
819 W. Congress St., Chicago
Please Mail Fan Parts Bargain Catalog
Send No. 12X754 Parts Set for 26" Tall Pedestal Fan at \$16.95 F.O.B. Chicago
Name
Address
(Paste Coupon on 1c Post Card and Mail Today)



The RATTAN Man Says:

(Trade Mark Reg.)
"Many modern industrial fixture lighting circuits now require No. 12 wire. You can make these connections with

The MARR NO. 2

solderless connector cheaper and better than with tape, solder and torch."

A Perfect Joint Connector

(Cap Made of Bakelite)



... and a permanent one, too. Simply insert the wires, turn on bakelite cap, and tighten with the screw driver.

Send for free samples.

See Your Electrical Dealer

Approved by Underwriters

THE RATTAN MANUFACTURING COMPANY

522 STATE STREET

NEW HAVEN, CONN., U. S. A.

GENERAL SALES AGENTS HATHEWAY AND CO.
75 MONTGOMERY ST., JERSEY CITY, N. J., U. S. A.

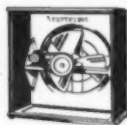
Sturtevant

REG. U. S. PAT. OFF.

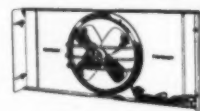
Puts Air to Work



Sturtevant Design 7
Propeller Fan
Made in sizes 12" to 45"
inclusive
Capacities
—680 to 15,450 c.f.m.
Direct connected motors
A V. Propeller Fans also
available with belt drive



Atticvane Fan Pressure Blower Ventilating Set



Wind-O-Vane Fan Wallvane Fan

STOCKS CARRIED AT MANY POINTS

B. F. STURTEVANT COMPANY
Hyde Park, Boston, Mass. Branches in 40 cities

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★ These companies have supplied additional buying information on their products in the 1941 edition of the Electrical Buyers' Reference.

SQUARE D

SAFETY SWITCHES

... Everywhere



SQUARE D pioneered in the development of the Safety Switch. Today it is difficult to walk far in any direction without seeing the familiar  emblem on safety switches and other electrical equipment.

There is a SQUARE D safety switch to meet every modern requirement. The hundreds of thousands now on duty tell a convincing story of their dependability.

CALL IN A SQUARE D MAN

SQUARE D COMPANY

DETROIT - MILWAUKEE - LOS ANGELES

IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO

G.E. OFFERS MATERIALS FOR EVERY WIRING JOB



IN FACTORIES, HOMES, ETC.

Distributors in All Parts of the Country

Wiring materials are available in the G-E line for wiring factories, homes, stores, office buildings, apartment houses, etc. The line is complete. It contains the materials you need whatever sort of job you are about to handle.

G-E distributors are located at key points all over the country. You will be able to obtain these materials right in your own territory.

The quality of G-E Wiring Materials is uniformly high. They are easy to use and will give dependable service. Your customers are sure to be pleased.

Two manuals have been prepared which will be helpful in planning industrial wiring and residential wiring. Further information about G-E Wiring Materials is also given in the manuals. For copies of them, see the nearest G-E Merchandise Distributor or mail the coupon.

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- G-E Black Conduit
- Flexible Conduit
- EMT
- Fiberduct
- BraidX
- BX
- CNX
- Boxes
- Fittings
- Wire Types:
 - R
 - RP
 - RH
 - RW
 - SN (Flamenol)
- All-rubber Cords
- Braided Cords
- Switches
- Sockets
- Convenience Outlets
- Plates
- Combination Devices
- Fuses
- Small Circuit Breakers
- Twist-Lock Devices
- Plugs, Caps, Bodies



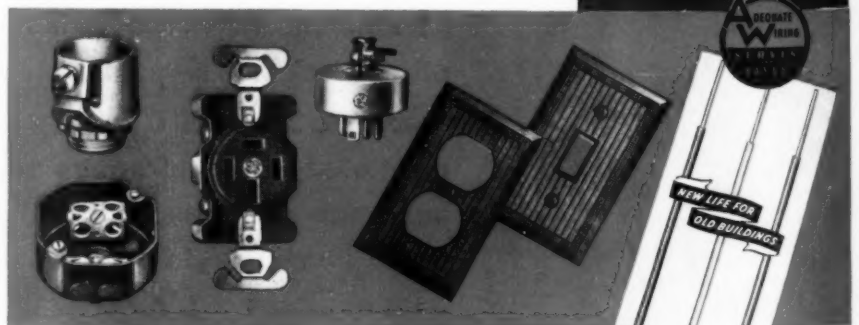
General Electric Company
Section CDW-185
Appliance and Merchandise Department
Bridgeport, Conn.

Sirs: Please send me ☐ the G-E Home Wiring Handbook
☐ Adequate Wiring for Industry

Name.....

Address.....

City.....State.....



GENERAL  ELECTRIC